

First unit

Chemicals



Lesson 1: Metals and Nonmetals

Lesson 2: Alkaline Acids

Lesson 3: Chemical Evidence and Salts

(Lesson-1) Metals and Non-metals**Metals and non-metals:**

Metals: It is a solid material that can withstand the surrounding conditions. It has a metallic luster, is a good conductor of heat and electricity, and is affected by chemical reactions with other elements.

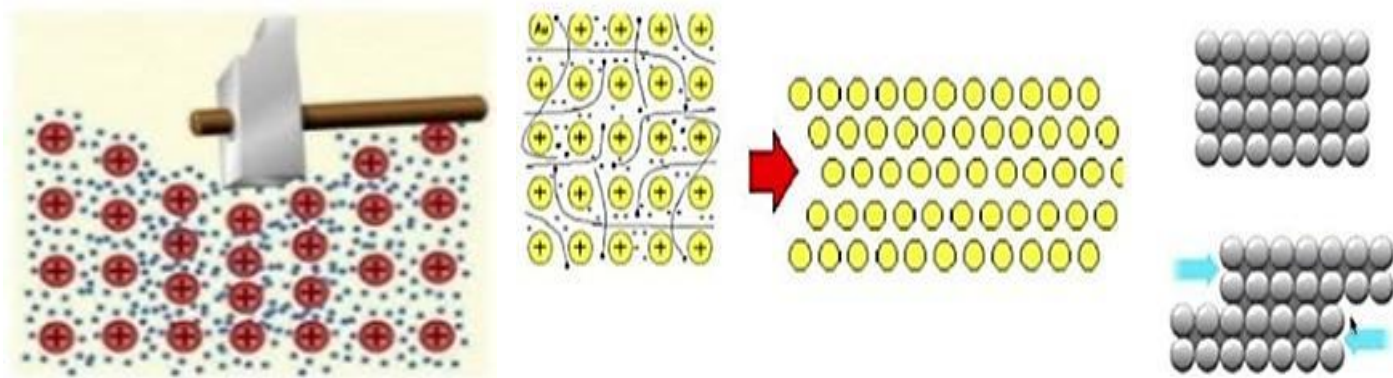
Non-metals: They are chemical elements that mostly lack metallic properties, and physically have a relatively low melting point and density. Non-metals are usually brittle in the solid state and have very poor thermal and electrical conductivity.

Metals	Non-metals
Most metals have 1, 2, or 3 electrons in their last energy level.	Most non-metals have 5, 6, or 7 electrons in their last energy level.
All metals are solids, except for mercury, which is in liquid form.	Non-metals exist in solid and gaseous form, except for bromine, which exists in liquid form.
It has a metallic luster.	It has no metallic luster.
Metals such as sodium, copper, zinc, and silver have a metallic luster and are ductile, malleable, and formable.	Nonmetals that do not have a luster (are dull) and are brittle, such as carbon and sulfur.
Metals are good conductors of electricity.	Non-metals are poor conductors of electricity, except for graphite, which is used in the manufacture of dry columns.
Metals have high melting points and conduct heat.	Nonmetals have relatively low melting points and are poor conductors of heat.



Road and traction ability:

Metals turn into sheets when hammered and into wires when drawn because the ions slide easily on top of each other.



The following table shows the properties of four elements:

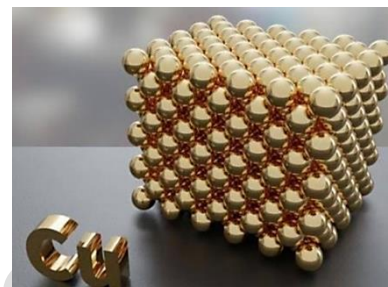
The element	Physical condition	Electricity connection	The color
(W)	solid	Poor delivery	colored
(X)	solid	Good delivery	black
(Y)	gas	Poor delivery	colorless
(Z)	liquid	Good delivery	colored

Which of the following represents some of these elements?

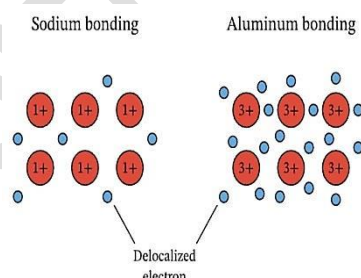
A-	(W) : sulfur	(Y) :Hydrogen	(Z) :Broom
B-	(W) :carbon	(Y) :Hydrogen	(Z) :mercury
C-	(X) :carbon	(Y) :Oxygen	(Z) :mercury
D-	(X) : sulfur	(Y) :Oxygen	(Z) :Broom

Metallic bond:

The atoms of a solid metal are arranged in an arrangement known as a lattice crystalline metal and is in the form of cations surrounding has a cloud of freely moving valence electrons. The term expresses Metallic bonding is the force of attraction between positive metal ions and the cloud of negative valence electrons surrounding it.



Some of the physical properties of metals are due to the bonding of their Atoms With metallic bonds, the metallic bond is responsible for the hardness Metals and their high melting point, as the hardness of metals increases by increasing the number of its valence electrons.

**Scientific skills:**

Metal	melting point
Sodium (Na)	98°C
Magnesium (Mg)	650°C
Aluminum (AL)	660°C

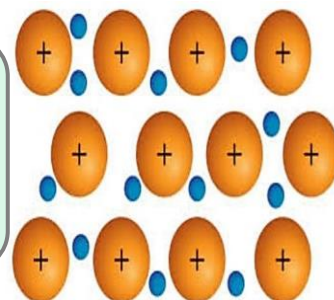
This is due to the availability of more electrons in the outer level in the case of aluminum.

Metallic bond:

The greater the positive ion charge, the stronger the metallic bond

The smaller the positive ion, the stronger the metallic bond.

The more delocalized electrons, the stronger the metallic bond.



- ☞ Metals are good conductors of electricity because they have delocalized electrons.
- ☞ Delocalized electrons can carry a charge when an electric potential is applied across the metal lattice.
- ☞ Delocalized electrons move toward the positive terminal, and the negative terminal produces more electrons.
- ☞ Metals are usually better conductors of electricity when they have a lot of delocalized electrons.
- ☞ Aluminum is a better electrical conductor than magnesium, and magnesium is a better electrical conductor than sodium.

Alloys:

- **Pure metals** They are soft and often unsuitable for industrial use, so one or more molten metals are often added to another molten metal to form what are known as alloys, whose properties differ from the properties of the elements that make them up.
- Alloys **Mixtures** Most of them are not expressed in molecular formulas.
- Alloy **Bronze** It is one of the most famous alloys used in the manufacture of jewelry, medals and statues. It consists of copper (95%) and tin (5%). The bronze alloy is characterised by being harder than copper and not susceptible to rust.

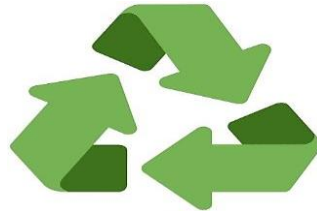


It is widely used in industries such as wire making and nail making, and commercial bronze does not spark. If you hammer it with steel, it is used in the manufacture of slides and hammers, and it also enters In the manufacture of tools used under harsh conditions such as flammable vapors and explosive atmospheres.



Life App:

- The process of converting waste into new usable materials is known as recycling



Some metals, such as copper, aluminum, and iron, are recycled for the following reasons.

- 1- Decrease in its presence in the earth.
- 2- Difficulty in extracting it of its raw materials.
- 3- The cost of recycling is lower than yhe cost of producing it from its raw materials.



Choose the answer Correct For questions The following:

1- All of the following are properties of the element sodium, except...

A-Metal

B- It has a metallic luster.

C- Poor conductivity of electricity

D- Easy to shape.

2- Which of the following indicates the correct order of hardness of sodium metals? ^{11}Na , magnesium ^{12}Mg , and aluminum ^{13}Al ?

A- $\text{Al} < \text{Mg} < \text{Na}$

B- $\text{Na} < \text{Mg} < \text{Al}$

C- $\text{Al} < \text{Na} < \text{Mg}$

D- $\text{Mg} < \text{Na} < \text{Al}$

3- Element (X) Its boiling point is 287°C and its melting point is 1064°C .

which of the following is a property of the element (X)?

A- Poor conductivity of electricity

B- fragile

C- Formable

D- Dark

4- Which of the following questions helps classify some elements into metals and nonmetals?

A- Is it solid?

B- Is it liquid?

C- Is it colored?

D- Is it fragile?

5-What is the common property between sodium and copper?

- A- The color
- B- Density
- C- Melting point
- D- Physical condition

6- The last energy level in most metal atoms ends at:

- A- 5 or 6 or 7 electrons
- B- 1 or 2 or 3 electrons
- C- 4 or 8 electrons

7- The only metal that exists in a liquid state at normal temperature is:

- A- Mercury
- B- Bromine
- C- Aluminum

8- The property responsible for the hardness of metals is:

- A- Covalent bond
- B- Metallic bond
- C- Ionic bond

9- Advantages of bronze alloy:

- A- Susceptibility to rust
- B- Its ductility and malleability
- C- Its rust resistance and hardness

10- One reason for recycling metals is:

- A- Its abundance in the Earth's crust
- B- High cost of recycling
- C- Decrease in its presence in the Earth's crust

Compare metals and non-metals in terms of:

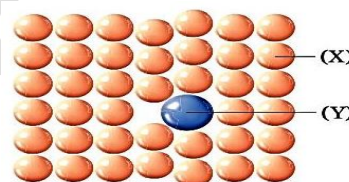
- Electricity connection
- ductility, malleability and shaping
- metallic luster

Non-metals	Metals	Comparison Point

The following figure represents the composition of the bronze alloy...

(1) What are the two elements? (X), (Y)?

(2) Why are alloys preferred over pure metals?



The following table shows the properties of three elements (metal, nonmetal, metalloid) in no order:

Its properties	The element
<ul style="list-style-type: none"> • solid at room temperature • Shiny • crisp • conductor of heat 	(X)
<ul style="list-style-type: none"> • solid at room temperature • Shiny • flexible • electrical conductor 	(Y)
<ul style="list-style-type: none"> • solid at room temperature • dark • crisp • poor conductor of electricity 	(Z)

Identify the metal and non-metal of these elements, with explanation.

Causes:

Metals have a high melting point.

.....

Graphite is used in the manufacture of dry columns, although it is a non-metal.

.....

Metals such as copper and aluminum are recycled.

.....

Complete:

- 1- All metals are solids except. . . ., While brome
- 2- The bond responsible for arranging metal atoms in the crystal lattice is
- 3- Bronze alloy consists of. . .95% and . . .5%.
- 4- One of the characteristics of metals is that they are good conductors . . . and . . .

Correct the mistake:

All nonmetals are gases except bromine.

.....

Metals are characterized by being brittle and not malleable and ductile.

.....

Alloys express their components by molecular formulas.

.....

Copper and tin make up the bronze alloy at 50% each.

.....

Extract the odd and strange word and mention what connects the rest:

- 1- Copper - Silver - Bromine - Mercury
- 2- Shiny - solid - metal - Mercury
- 3- Tin - Silver - Copper - Bronze

(Lesson-2) Alkaline Acids

The Scientist **Arrhenius** explained that:

Acid:	A substance whose dissolution in water increases the percentage of cations. H^+ in solution. It is responsible for all the properties of acids.
Alkaline:	A substance that, when dissolved in water, increases the percentage of anions OH^- in solution. It is responsible for all the properties of alkalis.

Atomic group

A group of atoms of different elements linked together, which behave like a single atom in a chemical reaction, have their own valence, and do not exist in an isolated state.

The following table shows some atomic groups and their molecular formulas:

Partial formula	Atomic group
OH^-	Hydroxide
NO_3^-	nitrate
NO_2^-	Nitrite
CO_3^{2-}	carbonate
HCO_3^-	Bicarbonate
SO_4^{2-}	sulfate
SO_3^{2-}	Sulfite
PO_4^{3-}	phosphate
NH_4^+	Ammonium

**Molecular
and bases:**

formula of acids

- The molecular formula of an acid begins with the symbol for hydrogen cation H^+ , the name of the acid is related to the name of the anion that enters into the formula.

- The molecular formula of an alkali ends with the formula hydroxide anion OH^- , the name of the alkali is related to the name of the cation that is part of its composition.

It is clear from the above:

-Acids that do not contain oxygen begin with the word acid followed by the syllable hydro, followed by the name of the anion.

Replacing the syllable (- ed) at the end with the syllable (- ic).

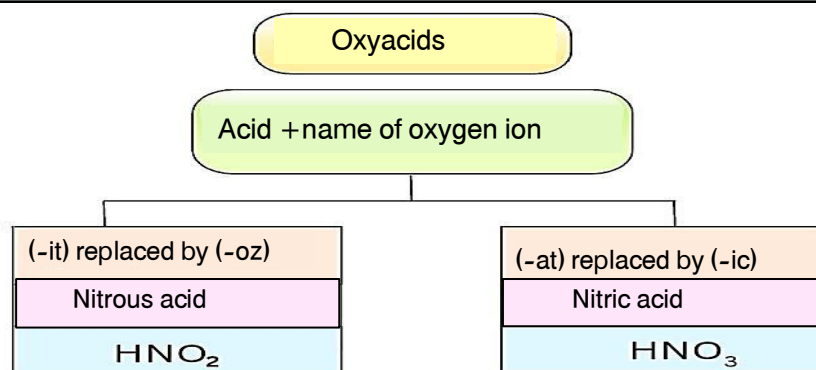
like hydrochloric acid

-Acids that contain oxygen (oxygenic acids) and the name of the anion ends with the syllable:

(-at): It begins with the word acid, followed by the name of the anion with the syllable (-at) replaced by the syllable (-ic).

(-it): It begins with the word acid, followed by the name of the anion with the syllable (-it) replaced by the syllable (-oz).

Such as sulfuric acid - nitric acid - chlorous acid



- The number of hydrogen atoms in an acid molecule It **equals** the amount of charge of the anion that forms it.
- Number of hydroxide groups in the alkali molecule It **equals** the amount of charge of the cation that forms it.
- The total charge of a molecule of any compound **equal ZERO**

Evaluate your understanding:

Write the formula and name of the acid that contains the following anions:

Iodide (I⁻):

Carbonates (CO₃²⁻):

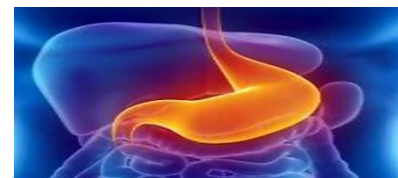
Chlorite (ClO₂⁻):

Integration with life sciences:

Acids play an important role in the human body, including:

-hydrochloric acid which is secreted by the stomach and contributes to the digestion of food

-Lactic acid which provides muscles with energy when oxygen is lacking, But its accumulation in the muscles causes muscle tension.



Properties of acids and alkalis:

There are many acids and alkalis in your home, such as lemon, ketchup and grapes. Acidic materials while detergents, toothpaste and baking soda are alkaline materials.



Acidic materials alkaline materials



***Acid** A substance that, when dissolved in water, increases cation ratio H⁺ in solution, it is responsible for all the properties of acids.

***Alkali** A substance that, when dissolved in water, increases anion ratio OH⁻ in solution, it is responsible for all the alkaline properties.

*Interact **Acids** with **Alkalis** Composed of salt and water, such as the reaction of hydrochloric acid HCl combines with sodium hydroxide solution NaOH to form

sodium chloride salt NaCl and water H₂O but does not react **Acids** with each other and also do not interact **Alkalis** with each other.

It is clear from the above:

strong acids Such as hydrochloric acid, nitric acid and sulfuric acid are good conductors of electricity, while **weak acids** such as vinegar (dilute acetic acid), sulfurous acid, and nitrous acid are poor conductors of electricity.

In the same way the electrical conductivity of sodium hydroxide solution varies (**strong alkaline**) about the electrical conductivity of ammonium hydroxide solution (**weak alkaline**)

1- Alkalis		2- Acids	
Definition			
Substances that decompose in water and give negative hydroxide ions(OH)-		Substances that decompose in water and give positive hydrogen ions(H+)	
Examples			
NaOH	Sodium hydroxide	HCl	hydrochloric acid
KOH	potassium hydroxide	H ₂ SO ₄	sulfuric acid
Ca(OH) ₂	Calcium hydroxide	H ₂ CO ₃	carbonic acid
		HNO ₃	nitric acid
The taste			
It tastes astringent and has a soapy texture.		It tastes sour.	
Origin			
The union of a negative hydroxide group with a positive atomic group or a metal. Its chemical formula ends with a hydroxide group.		Hydrogen bond with a negative atomic group other than hydroxide (OH)-. or some non-metallic elements except oxygen. Its chemical formula begins with hydrogen.	
Effect on litmus paper			
The color of the sunflower paper turned blue.		The litmus paper turned red.	

Medical application:

- Milk of magnesia is used as a temporary remedy to neutralize stomach acid.
- Because it contains hydroxide Magnesium $\text{Mg}(\text{OH})_2$
- Acids and alkalis conduct electricity to varying degrees, depending on their strength.

Is there a relationship between metals and alkalis, nonmetals and acids?!

*Metals burn in the presence of oxygen forming metal oxides are known as it is in water to form magnesium hydroxide solution $\text{Mg}(\text{OH})_2$.

*Nonmetals burn in the presence of oxygen to form nonmetal oxides, most of which are composed of basic oxides, and what dissolves in water is alkalis.

*As in the combustion of magnesium, forming magnesium oxide (MgO) which dissolves known as acidic oxides, which dissolve in water to form acids.
As in the combustion of sulfur, forming carbon trioxide (SO_3), which dissolves in water to form a solution of sulfuric acid (H_2SO_4).

*Metal oxides react with acids but not with alkalis, while oxides of Non-metals do not react with alkalis and not react with acids.



combustion of magnesium



Sulfur combustion

Types of oxides			
Metal oxides		nonmetal oxides	
It consists of the union of oxygen with a metallic element.		It consists of the union of oxygen with a non-metallic element.	
Examples			
Na ₂ O	sodium oxide	CO ₂	carbon dioxide
K ₂ O	potassium oxide	SO ₃	sulfur trioxide
MgO	Known as basic oxides	SO ₃	Known as acidic oxides
magnesium hydroxide	Dissolves in water to form bases.	sulfuric acid	It dissolves in water, forming acids.



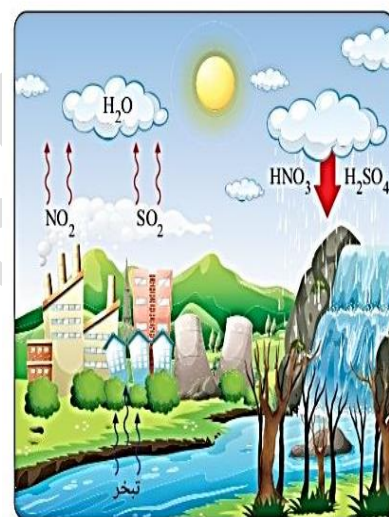


There are some oxides that behave in both ways and are called ambiguous oxides, such as: **Aluminum oxide** (Al_2O_3)

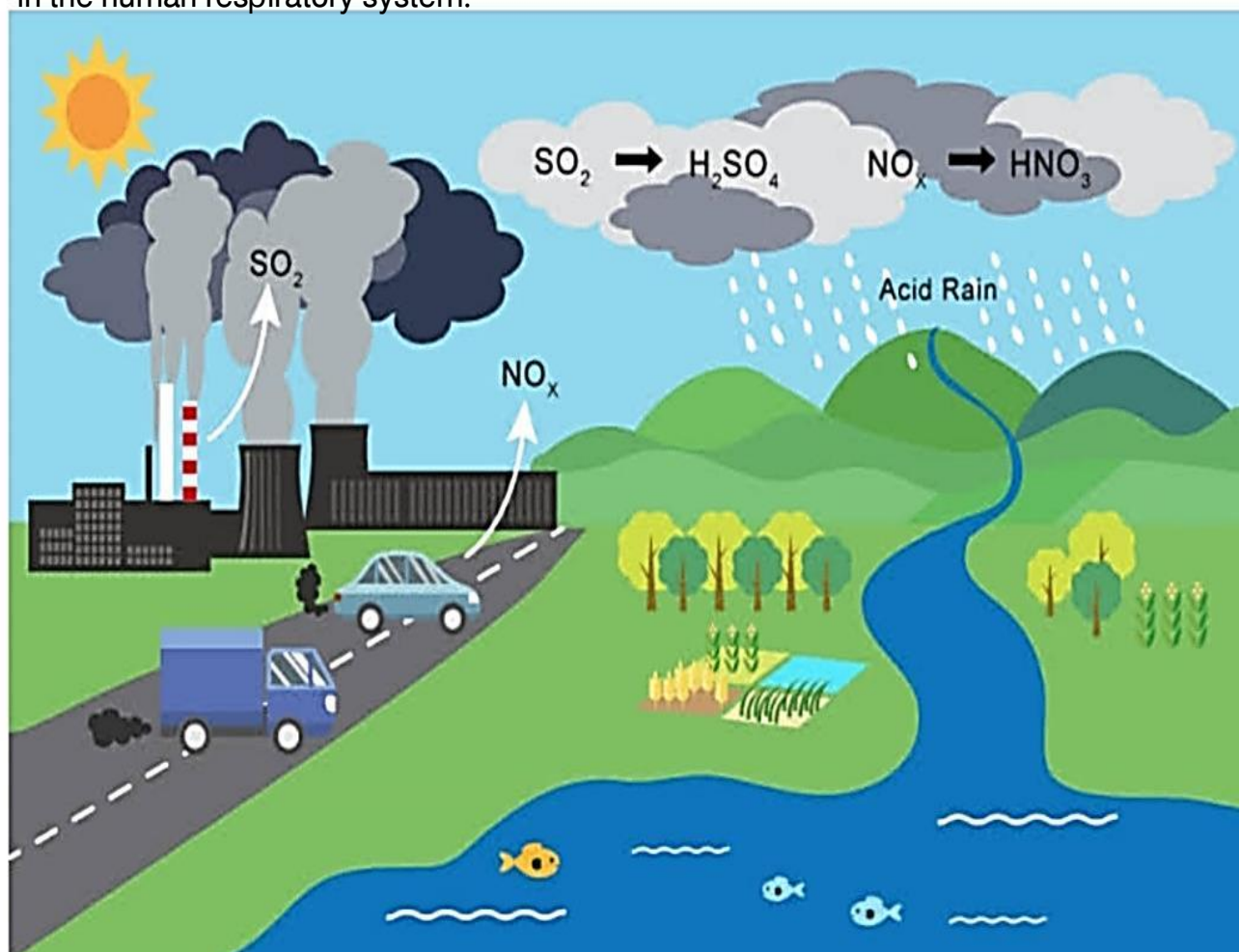
Integration with life sciences:

*The combustion of fossil fuels such as petroleum and coal in cars, power plants and factories produces acidic oxides such as nitrogen dioxide (NO_2) sulfur dioxide (SO_2).

*The dissolution of nitrogen and sulfur oxides in the water vapor of the atmosphere and their accumulation in clouds leads to the fall of rain called with acid rain. Which causes severe damage, as it leads to the destruction of forests, harms living organisms living in water bodies, and erodes building stones, in addition to causing health problems



in the human respiratory system.



Choose the correct answer:

1- The acid secreted in the stomach to digest food is:

- A -sulfuric acid
- B- hydrochloric acid
- C- nitric acid

2- The alkaline substance used to temporarily treat heartburn is:

- A-Sodium hydroxide
- B- ammonium hydroxide
- C- magnesium hydroxide

3- The polyatomic anion known as sulfate has a molecular formula of:

- A- SO_3^{-2}
- B- SO_4^{-2}
- C- HSO_4^-

4- Produced by the combustion of sulfur in the presence of oxygen:

- A- Sulfur oxide
- B- Sulfur trioxide
- C- Sulfuric acid directly

5- When hydrochloric acid reacts with sodium hydroxide, it forms:

- A- Water only
- B- salt only
- C- salt and water

6- If the anion is part of the acid composition HClO is called hypochlorite, this acid is called...

- A- hypochlorous acid
- B- hypochloric acid
- C- perchloric acid
- D- Chloric acid

7- Which ion increases in proportion when any acidic oxide is dissolved in water?

- A- H^+
- B- OH^-
- C- Cl^-
- D- Na^+

8- Element (X) The oxide XO that reacts with acids is formed. Which of the following represents both the element (X) and the oxide XO ?

- A- (X): Metal, : XO acid oxide
- B- (X): Metals, XO acid oxide
- C- (X): Metal, : XO basic oxide
- D- (X): Non-metal, XO : basic oxide

9- When gallium oxide is dissolved in water and two litmus strips are placed in the solution, one of them changes color to?

- A- Red
- B- Violet
- C- Blue
- D- Yellow

10- Which of the following expresses the properties of solid sodium hydroxide?

- A- It dissolves in water and reacts with HCl acid.
- B- It dissolves in water and does not react with HCl acid.
- C- It does not dissolve in water and does not react with HCl acid.
- D- It does not dissolve in water and reacts with HCl acid.

Write the names of the following acids and alkalis:

- (1) H_2CO_3
- (2) HF
- (3) $\text{Mg}(\text{OH})_2$ LiOH

Write the chemical formula for each of the following compounds:

- (1) Sulfuric acid.
- (2) Sodium hydroxide

Can you identify?:

What is the type of potassium hydroxide solution using blue litmus strip? With explanation.

.....

.....

The element oxide is characterized by (X) With the following properties:

Reacts with acids.

It does not react with alkalis.

Is the element (X) is it sulfur or copper? With explanation.

The following two figures For a single statue left in an open space over a period of approximately 100 years:

Why did the details of the statue disappear within the limits of what you studied?

.....



Causes:

1- Metal oxides are alkaline when dissolved in water.

.....

2- Strong acids conduct electricity well.

.....

3- Acid rain causes erosion of buildings and destruction of forests.

.....

Complete:

1- The acid that supplies energy to muscles when oxygen is lacking ...

2- Acids that contain the element oxygen and whose anion name ends with the suffix (-ate) have their name ending with the suffix ...

3- The result of burning fossil fuels leads to the formation of ... which cause environmental and health problems.

4- The polyatomic anion known as nitrate has a molecular formula of ..., while nitrite has a molecular formula of ...

Correct the mistake:

1- All acids contain the element oxygen in their composition.

.....

2- Alkaline reacts with other alkalis to form water and salts.

.....

3- The total charge of any compound is +1.

.....

4- Acid rain contains only sulfuric acid.

.....

(Lesson-3) Chemical evidence and salts**Chemical evidence:**

Addition is performed **sulfuric acid** the center of table sugar turns it charred, which indicates its danger. Therefore, it is absolutely forbidden to taste, smell, or touch any chemical substance in the laboratory without the teacher's permission, because there is **Corrosive acids** and **caustic alkalis**.



If we cannot identify chemicals such as **Acids** and **Alkalis** solutions by taste or smell, how then can we distinguish between **Acidic materials** and **alkaline materials** and **neutral materials**?

conclude from the above:

-Distinguish between **Acids** and **Alkalis** and **neutral** materials Like distilled water is done using chemicals called indicators, which are substances that change color in **Acidic medium** on **Alkaline medium**, such as the sunflower dye guide that goes into making litmus strips.

-Distilled water **neutral** the effect does not change the color of the litmus strip, as the number of ions is equal H^+ in it with the number of OH^- ions

-The sunflower guide is not suitable for distinguishing between **strong acids** and **weak acids** because they have the same color.

-There are many other indicators besides litmus, the most famous of which is the universal indicator which comes in the form of dye or strips, which can distinguish between **Acids** and **Alkalis** or **Acids and some** or **Alkalis and some** According to its strength.



universal guide strips and dye

Evaluate your understanding.

Pigments are extracted from some plants to be used as guides, from the table:

Plant	Dye color	Dye color in acid	Dye color in alkali
(W)	crimson	purple	green
(X)	green	yellow	yellow
(Y)	purple	purple	yellow
(Z)	orange	red	green

Which of these plant pigments is not suitable for use as a guide?

A- (W)

B- (X)

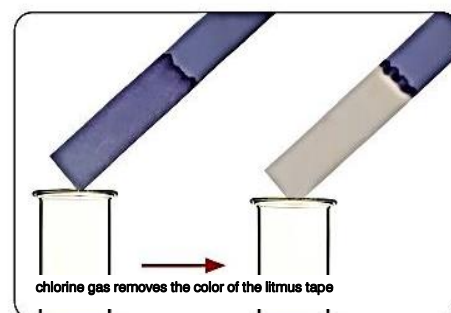
C- (Y)

D- (Z)

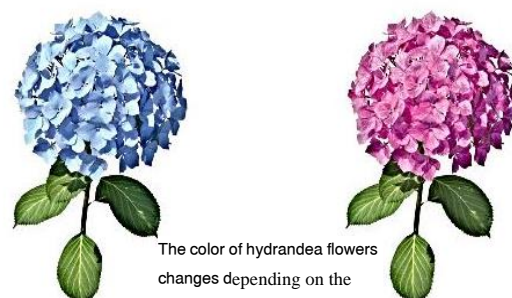
Acidity and alkalinity test:

1- Evidence strips must be wetted with water when testing **acid gases** Like carbon dioxide gas (CO_2) or **basic gases** like ammonia gas (NH_3) to dissolve it, In general, evidence only works in the presence of an aqueous medium.

2- Gaseous elements such as N_2 , O_2 , H_2 do not change the color of the indicators, except chlorine gas (Cl_2) which removes the color of the litmus strip.

**Integration with agricultural sciences:**

The color of hydrangea flowers varies depending on the type of soil. The flowers turn red when



planted in acidic soil, while they turn blue when planted in alkaline soil.

Medical application:

Acidic soil is treated by adding basic materials to it.

Like: calcium hydroxide Ca(OH)_2

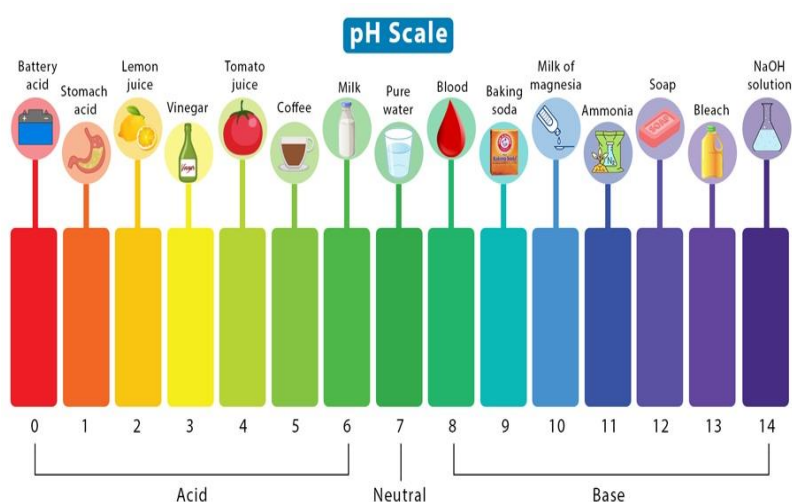
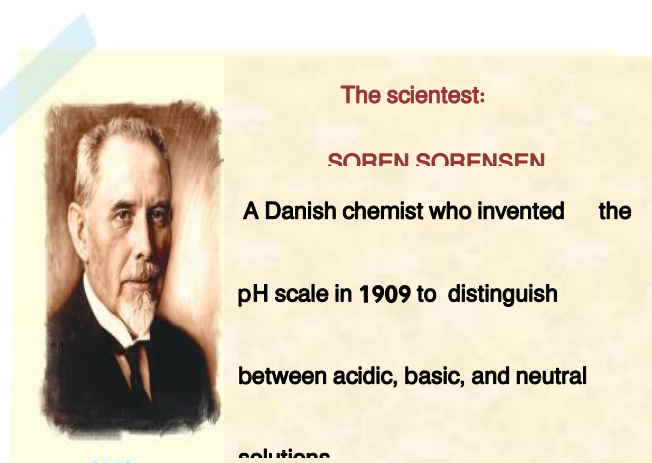
Cross-cutting concepts: cause and effect:

Most chemical indicators change color depending on the type of solution used

pH:

The acidity of tomatoes is different from that of lemons, so how can we accurately determine their acidity?

The acidity or basicity of solutions is determined by what is known by pH, which is symbolized by the symbol ph which is a scale graduated from 0 to 14.



- The value is the pH of neutral solutions and distilled water is 7, while its value for acids is less than 7 and for alkalis is greater than 7.

- The strength of the acidic solution increases as the pH value approaches 0, while the strength of the alkaline solution increases as the pH value approaches 14.
- The pH values of solutions are measured directly and accurately using a pH meter.



pH meter reading for NaOH solution



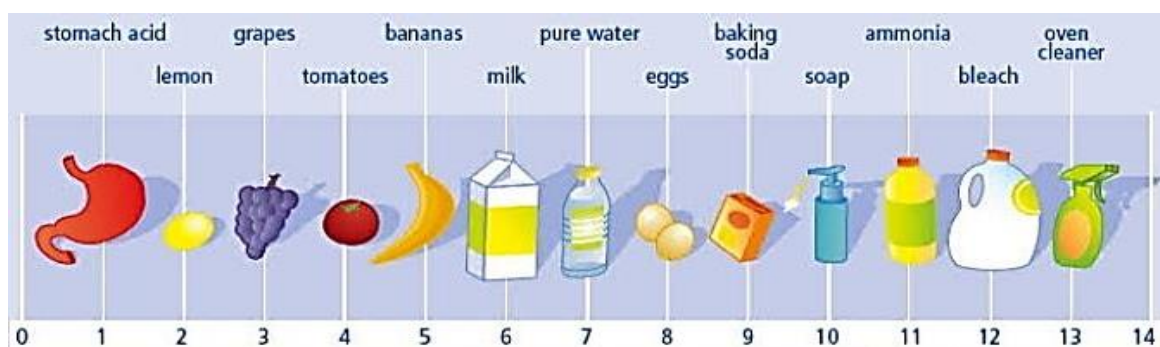
pH meter reading for HCl

Or roughly using strips universal guide by comparing the color of the strip after immersing it in the solution whose pH value is to be measured with the model attached to the strip package, in which each color represents a specific pH value.



Evaluate your understanding:

The next shape illustrates pH values of some materials:



- (1) What is the strongest alkaline substance, and what is its pH value?
.....
- (2) What is the strongest acid, and what is its pH value?
.....
- (3) Compare the acidity of grapes and tomatoes, with explanation.
.....
- (4) Compare the alkalinity of baking soda and ammonia solution with explanation.
.....

A Life App:

The pH values of skin and hair care products differ, the pH value of the shampoo used to clean dry hair is different from that used to clean oily hair.



Salts:

A salt molecule can be formed by the combination of:

- *Metal ion and nonmetal ion, Except for the negative oxygen ion (oxide O^{2-})
- *An ion of an element and an ion of an atomic group, except the hydride and oxide group OH^-
- *Two ionic atomic groups.

-When the same atomic group is repeated in the molecular formula of a compound, the atomic group is written between brackets, and below it is the number that indicator of the number of repetitions.

-The name of a salt begins with the name of the anion followed by the name of the cation.

Salts consist of...

positive atomic group union		positive metal ion union	
with negative atomic group	with negative nonmetal ion	with negative atomic group	with negative nonmetal ion
ammonium sulphate	ammonium chloride	Sodium sulfate	sodium chloride
$(NH_4)_2SO_4$	NH_4Cl	Na_2SO_4	$NaCl$
ammonium nitrate	ammonium bromide	Magnesium carbonate	sodium sulfide
NH_4NO_3	NH_4Br	$MgCO_3$	Na_2S

Properties of salts:

"It varies ~~salts~~ they differ from each other in term of color, water solubility and PH value of its solutions.

"**Salts** Solids, some of which are white in colour, such as: **salt** Zinc sulphate (ZnSO_4) and **salt** Sodium carbonate (Na_2CO_3) and some A Colorful like: **salt** Copper sulphate (CuSO_4) Blue color and nickel chloride salt (NiCl_2) is green in color.



"some **Salts** It dissolves in water, forming solutions such as: Copper sulphate and nickel chloride and all **Salts** Sodium, potassium, ammonium, and nitrates, some of which are insoluble (sparingly soluble) in the water like Silver chloride (AgCl) and calcium sulfate CaSO_4 And all **Salts** carbonates, except sodium, potassium and ammonium carbonates.



Salts that do not dissolve in water		salts that dissolve in water	
Like			
AgCl	silver chloride	NaCl	Sodium chloride
PbI2	Lead iodide	K2SO4	Potassium sulfate
PbSO4	Lead sulphate	Na2S	Sodium sulfide
MgCO3	Magnesium carbonate	Ca(NO3) ²	Calcium nitrate

Integration with physics:

The salinity of water is considered the dead sea, It has the highest salinity levels in the world about 10 times From the salinity of the water the red sea Therefore, it is not possible to drown in the Dead Sea water, as the high percentage of salts in the water leads to an increase in its density.

It is clear from the above:

*Salt solutions may be...

Acidic	such as ammonium chloride solution	$7 > \text{PH}$
Neutral	Like sodium chloride solution	$7 = \text{PH}$
Alkaline	Like sodium carbonate solution	$7 < \text{PH}$

*Acid and alkaline solutions are similar to salt solutions (Mixtures of salts dissolved in water) and its melting pots (molten salts) in the conduction of electrical current.

*Solid salts do not conduct electricity, and neither does distilled water.

	Common name	Chemical formula
sodium chloride	salt	NaCl
Sodium nitrate	Chilean saltpeter	NaNO ₃
Aqueous copper sulphate	Blueberry salt	

How can we distinguish between sodium chloride and silver chloride?

By adding a little water to each of them and stirring or shaking, we notice that sodium chloride dissolves in water.

while silver chloride does not dissolve in water.

Choose the correct answer:

1- A chemical guide that can distinguish between acids and alkalis and each other according to their strength:

A- Sunflower Dyeing Guide

B- Universal Guide

C- device pH meter

2- The pH value is pH of distilled water:

A-Less than 7

B- equals 7

C- greater than 7

3- The substance used to adjust the acidity of acidic soil is:

A- Sodium hydroxide

B- Calcium hydroxide

C- Calcium sulfate

4- A salt that dissolves in water to form a basic solution is:

A- Sodium carbonate

B- ammonium chloride

C- Calcium sulfate

5- One reason not to drown in the Dead Sea waters is:

A- Low salinity

B- high water density

C- Increase in temperature

6- A red litmus strip was placed in solution (1) and its colour did not change, when it was placed in solution (2) its colour turned blue. Which of the following is true?

A- Solution (1) is neutral, solution (2) is acidic.

B- Solution (1) is acidic, solution (2) is neutral.

C- Solution (1) Acidic, solution (2) Alkaline.

D- Solution (1) is alkaline, solution (2) is acidic.

7- The color of the universal guide is similar in both

A- Tomato juice and hydrochloric acid.

B- Distilled water and sodium chloride solution.

C- Tomato juice and sodium hydroxide solution.

D- Distilled water and hydrochloric acid.

8- All of the following are ions that make up salts, except ...

A- OH-

B- Cl-

C- NH₄⁺

D- NO₃⁻

9- All of the following are properties of solid sodium carbonate salt except

- A- It dissolves in water.
- B- PH of its solution is greater than 7
- C- white.
- D- electrical conductor.

10- Value conversionA pH of a solution from 8 to 5 means that it was....

- A- Acidic and became alkaline.
- B- Acidic and became neutral.
- C- Alkaline and became neutral.
- D- It became alkaline and acidic.

From the following table:

Guide	Change in color of the guide	pH at which the indicator changes color
(X)	Red → Yellow	4
(Y)	yellow ← blue	6.4

What is the value? what is the pH of the solution that turns yellow when either of the two indicators (X) or (Y) is added to it?

What happens to the colors of the litmus strips in the following two cases?



Soil acidity varies from place to place:

- (1) How to treat acidic soil?
- (2) What color are the flowers of hydrangeas grown in acidic soil?

Write the molecular formula for the salts formed by the following cations and anions:

- (1) PO_4^{3-} , K^+
- (2) SO_4^{2-} , Al^{3+}
- (3) NO_3^- , NH_4^+
- (4) CO_3^{2-} , Mg^{2+}

Causes:

Chemical indicators only work in the presence of an aqueous medium.

.....
The colors of hydrangea flowers vary depending on the type of soil.

.....
Solid salt does not conduct electricity.
.....

Complete:

- 1- The pH is measured accurately using a device or roughly using ...
- 2- The value is pH of basic solutions ... From 7, and its strength increases the closer it gets to ...
- 3- When the same atomic group is repeated in the molecular formula of a compound, the atomic group is written between ... and below it ...
- 4- Some salts dissolve in water, such as: ..., While other salts such as ...

Correct the mistake:

- 1- Salt can be formed from the combination of a metal ion and an oxide ion.
- 2- All salts dissolve in water.
- 3- The salt resulting from the reaction of an acid with a base is always neutral pH.
- 4- Acid and alkaline solutions only electric current.

Compare between:

Acids and bases by (pH):

Alkalis	Acids

Solid salt and saline solutions in electrical conduction:

Saline solutions	hard salt

Think and answer:

You have two bottles, one contains acid and the other contains alkali. How do you distinguish between them in the laboratory?

1-Choose the correct answer:

1- The last energy level in most metal atoms ends with:

A- 5 or 6 or 7 electrons

b- 1 or 2 or 3 electrons

C- 4 or 8 electrons

2- The only metal that exists in a liquid state at normal temperature is:

A- Mercury

B- Bromine

C- Aluminum

3- The property responsible for the hardness of metals is:

A- Covalent bond

B- Metallic bond

C- Ionic bond

4- The acid secreted in the stomach to digest food is:

A- sulfuric acid

B- hydrochloric acid

C- nitric acid

2- Complete:

1- The acid that supplies energy to muscles when oxygen is lacking is

2- Acids that contain the element oxygen and whose anion name ends with the suffix (-ate) have their name ending with the suffix....

3- Some salts dissolve in water, such as ..., While other salts such as

4- The pH is accurately measured using a device or roughly using

3- Put a (✓) or (X) mark:

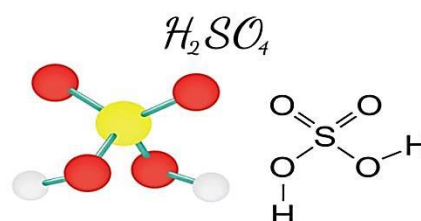
1- Salt can be formed from the combination of a metal ion and an oxide ion. ()

2- All salts dissolve in water. ()

3- The salt resulting from the reaction of an acid with a base is always neutral pH.()

4- Only acid and alkaline solutions conduct electricity. ()

4- From the opposite figure:



1- What is the name of the acid??

2- How is it detected??

5-Compare between:

Solid salt and saline solutions in electrical conduction:

Saline solutions	hard salt
.	.

Second unit
Energy



Lesson 1: Potential Energy

Lesson 2: Potential Energy

Lesson 1: Potential Energy

Lesson 2: Potential Energy

(Lesson-1) Potential Energy**Distance, displacement and velocity:**

When a camel wanders in the desert, its owner follows its footsteps to find out its path, the path of any moving body is defined as the set of points it passes through during its movement.

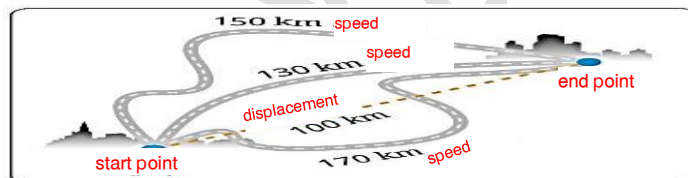


The set of points defined for the path



Traces of a camel's on the sand

the opposite figure describes the total length of any path taken by the body while moving from the starting point to the end point, (the distance), and the shortest straight path connecting the starting point and the end point in a constant direction (the displacement)

**Cross-cutting concepts: scale, ratio, and proportion:**

Both distance and displacement are measured in the same unit of measurement, which is the meter (m) or its multiples, such as kilometer (km), or parts of it such as centimeter (cm).

$$1\text{km} = 1000\text{m} , 1\text{m} = 100\text{cm}$$

The distance traveled per unit of time is:

Speed (v)

Speed is measured from the following mathematical relationship

Speed (v)	distance (d)
	time (t)

Speed is measured in several units, including:

meter/second (m/s)

kilometer/hour (km/h)

Mathematical understanding:

Calculate the speed of a body that covers a distance of 8m in a time 2s

$v = \frac{d}{t} = \frac{8}{2} =$	distance (d)	= 4m/s
	time (t)	

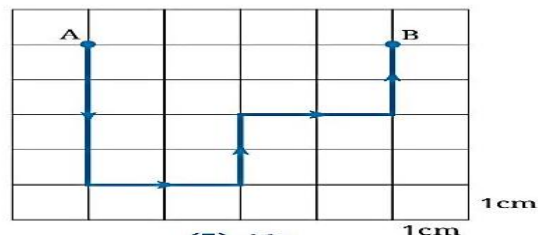
Evaluate your understanding:

-The following figure shows the path of a body from point (A) To point (B) in a time of 24s : Calculate the amount of each of:

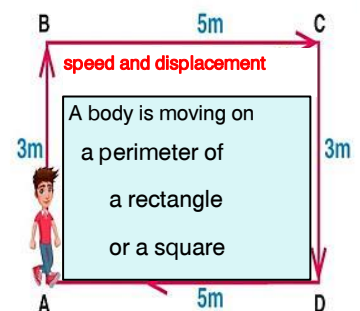
(1) Distance.

(2) Speed.

(3) Displacement.



-The following figure shows a student walking on a closed path. Calculate the distance he covered? Calculate his displacement.

**Work (W):**

It is said about a weightlifter that:

He does no work while standing, but he does work while he is getting up .

It is clear from the above:

Force does work when it affects an object, causing it to move in the same direction as its effect. the greater the amount of force, the greater the work done.



Work (W)

The amount of energy required to move an object a certain displacement in the same direction as the force acting on it.

Joule
Newton
Meter

Work is measured in units joule (J)

Force is measured in newton (N)

Displacement is measured in meter (m)

Joule
Newton
Meter

The work must be done from the following mathematical relationship:

$$\text{Work (W)} = \text{Force (F)} \times \text{Displacement (S)}$$

Mathematical understanding:

A person pushes an object with force 20N, It moved in a straight line a distance of 50M in the same direction of force.

-Calculate the amount of work done.

$$W = F \times S = 20 \times 50 = 1000\text{j}$$

Analytical thinking:

Each robot in the form does work in lifting a number of bricks to different heights.



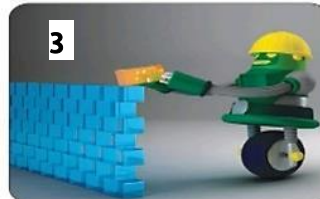
1

It applies a force of 20N on 2 bricks to lift it 3m vertically



2

It applies a force of 30N on 3 bricks to lift it 3m vertically



3

It applies a force of 10N to 1 brick to lift it 3m vertically



4

It applies a force of 30N on 3 bricks to lift it 2m vertically

Explain mathematically how many robots do the same amount of work.

.....
.....

Energy (E):**Energy**

It is the ability to do work, and is measured in units of joules (J)

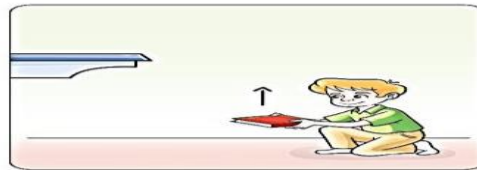
From energy images:

potential energy

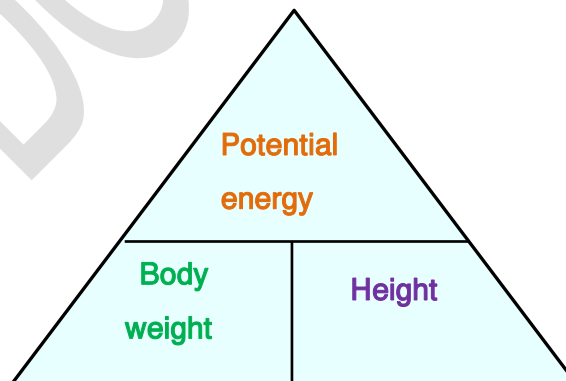
kinetic energy

Potential energy (PE):

When a person lifts a book to a shelf high above the ground, he does work that turns into energy stored in the book.



The energy stored in the body, as a result of the work done on it, is known as potential energy.

**Scientific processes in controlling variables:**

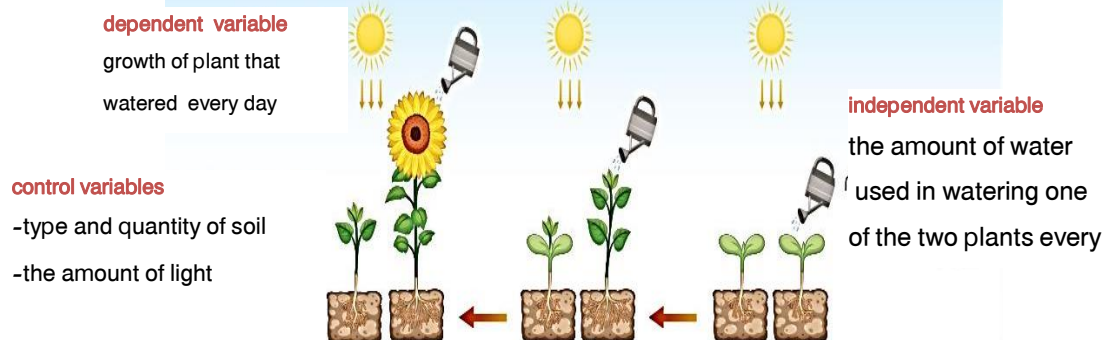
Controlling variables is one of the skills of scientific research and designing scientific comparative experiments, Controlling variables is necessary to study the causes and consequences resulting from them.

The three most important variables are:

Independent variable (cause): The variable that is changed during the experiment.

Dependent variable (outcome): The variable to be tested that changes with the change in the independent variable.

Control variables: variables that remain constant during the experiment.

Application:It is clear from the above:

Objects elevated above the Earth's surface have potential energy (PE)

Its amount depends on each of:

Body weight (w) its unit of measurement is Newton (N)

The height of the body above ground level (h) its unit of measurement is meter (m)

The potential energy is determined from the following relationship:

Potential energy (PE) = Body weight (W) X Height (h)

Potential energy is measured in joule (J)

Body weight (w) = body mass (m) x gravitational field strength (g)

Potential energy (PE) = body mass (m) x gravitational field strength (g) x height (h)

[The strength of the Earth's gravitational field is approximately equal to 10 N/kg]

Mathematical understanding:

A body of mass 50kg from the ground to height H above the ground by 150 work.
Note that the intensity of the Earth's gravitational field $1\text{KJ} = 1000\text{ J}$, 10N/kg

calculate:

(1) potential energy of the body.

The potential energy of a body represents the amount of work done on the body.

Potential energy of the body = 150 KJ

(2) The amount of height (h)

$$PE = mgh$$

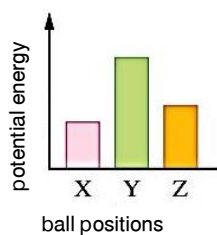
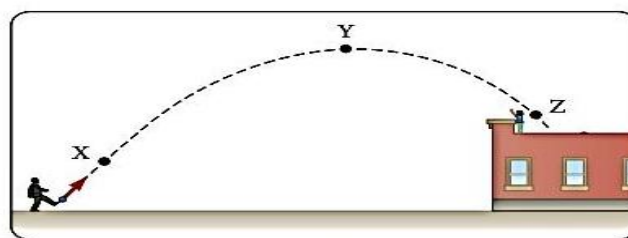
$$150 \times 1000 = 50 \times 10 \times h$$

$$h = \frac{150 \times 1000}{50 \times 10} = 300\text{ m}$$

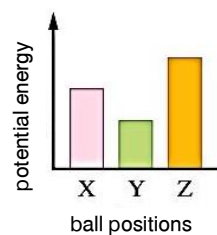
Evaluate your understanding:

The figure shows the path of a soccer ball kicked by a player, The letters (X), (Y), (Z) represents three positions in the path of the ball's movement.

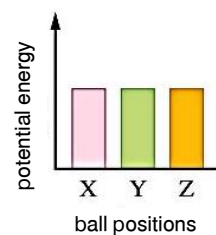
Which of the following expresses the potential energy of the ball in the three positions X, Y, Z?



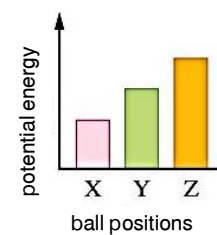
A



B



C



D

Integration with chemistry:

The chemical energy in food and fuel is potential energy stored in chemical bonds, which is released and converted into kinetic energy when a chemical reaction occurs.



Questions

Choose the correct answer:

1- The following figure represents an experiment that included four attempts (W), (X), (Y), (Z):

Which of the following represents the controlling variable and the independent variable?

Choices	Independent variable	Control variable	The two attempts
A	Mass	Height	(W),(X)
B	Mass	Height	(W),(Y)
C	Height	Mass	(X), (Y)
D	Mass	Height	(X), (Z)

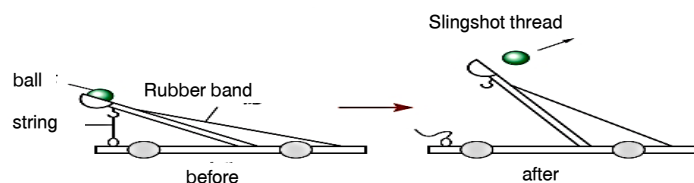
2- In which of the following cases is work done?

- (a) Picking up a bag from the floor, pushing a shopping cart.
- (b) Carrying a backpack and walking with it, Pushing a shopping cart.
- (c) Picking up a bag off the ground, pushing a tree.
- (d) Carrying a backpack and walk with it, pushing a tree.

3- The potential energy of a body depends on

- (a) Its weight and speed.
- (b) Its weight and mass.
- (c) Its speed and height above the Earth's surface.
- (d) Its weight and height above the ground.

4- The following figure shows the motion of a ball after the slingshot string is cut:



Choices	Because the rubber band stores potential energy	Change
(A)	less before cutting the thread.	use a larger mass ball.
(B)	larger before cutting the thread.	use a longer rubber band.
(C)	less before cutting the thread.	use a shorter rubber band.
(D)	greater before cutting the thread.	use shorter rubber.

5- The shortest straight path between the starting point and the ending point is known as:

- (A) Distance (B) Displacement (C) Speed

6- The unit of work is:

- (A) Newton (B) Joule (C) meter

7- The correct relationship to calculate potential energy is:

- (A) $PE = m \times g \times h$ (B) $PE = F \times S$ (C) $PE = t/d$

8- The variable that is changed during an experiment is known as the:

- (A) Dependent variable
(B) Independent variable
(C) Control variable

9- The strength of the Earth's gravitational field is approximately equal to:

(A) 10 N/m

(B) 10 N/kg

(C) 9.8 m/s²

Calculate:

The time how taken by a car moving at a speed of 40 m/s to cover a distance of 200m

.....

Calculate height body with a mass of 6kg above the ground when its potential energy is 180J knowing that Earth's gravitational field strength is 10 N/KG.

.....

What does it mean that the speed of a body 100 m/s?

.....

Causes:

1- The weight lifter does work while lifting the weight.

.....

2- The body has no potential energy when it is on the surface of the Earth.

.....

3- Chemical energy is released when a chemical reaction occurs.

.....

Complete:

1- Distance and displacement are measured in units of or its multiplies such as....

2- Work is calculated from the relationship: Work (W) = ×

3- Potential energy depends on ...the body and ... above the Earth's surface.

4- The relationship between body weight and mass is written: body weight = \times

Correct the mistake:

1- Speed is measured in Newtons.

2- Work is always done only when there is a force.

3- Potential energy does not depend on the mass of the body.

4- Potential energy equals (S \times W).

comparison:

1- Compare distance and displacement:

displacement	Distance

2- Compare energy and work:

Work	Energy

Mathematical sum:

Robot A lifts 5 bricks with a weight of 20N each to a height of 3m.

Robot B lifts 10 bricks with a weight of 10N each to a height of 1.5m.

Calculate the work done by each robot, and determine which one does the same work.

.....

(Lesson-2) Kinetic Energy**Kinetic energy: KE**

The work done by the truck is greater than the work done by the car even though their speeds are the same, why?



The work done by the blue car is greater than the work done by the red car even though their masses are equal, why?

It is clear from the above:

Kinetic energy of any body (KE) depends on each of:

Body mass (m) its unit of measurement is kilogram (kg)

Body speed (v) its unit of measurement is meter/second (m/s).

Kinetic energy is determined from the following mathematical relationship:

$$\text{kinetic energy (KE)} = \frac{1}{2} \text{ mass (m)} \times \text{velocity squared (V)}^2$$

Kinetic energy is measured in joule (J)

Mathematical understanding:

Calculate kinetic energy of a metal ball of mass 2kg moving at a speed of 3m/s

$$\begin{aligned} \therefore \text{KE} &= \frac{1}{2} Mv^2 \\ &= \frac{1}{2} \times 2 \times (3)^2 \\ \therefore \text{KE} &= 9\text{j} \end{aligned}$$

Evaluate your understanding:

Two bodies (X) and (Y), the mass of the body (X) is twice the mass of the body (Y), and the speed of the body (X) is half the speed of the body (Y).

Is the kinetic energy of the body (X) equal to the kinetic energy of body (Y)?
with explanation.

.....

Cross-cutting concepts: cause and effect:

- Increasing the mass of the moving body leads to an increase in Kinetic energy, and vice versa.
- Increasing the speed of a moving body leads to an increase in Kinetic energy, and vice versa.

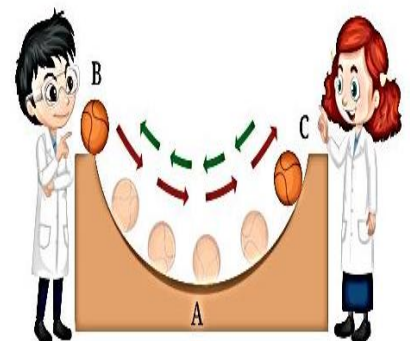
Scientific skills:

Compare potential energy (PE) and kinetic energy (KE), by completing the table:

	kinetic energy (KE)	potential energy (PE)
Definition
Influencing factors
The mathematical relationship used in the calculation
Unit of measurement

The relationship between potential and kinetic energy:

When the ball is lifted from its original position A to position B, potential energy is stored in the ball, and when it is allowed to fall, the potential energy is converted into kinetic energy.



It is clear from the above:

- The potential energy of a body is greatest at its maximum height above its original position.
- Kinetic energy is greatest when it passes through its original position.
- A decrease in potential energy is followed by an increase in kinetic energy.
- The decrease in potential energy is equal to the increase in kinetic energy.
- The sum of the potential and kinetic energies of any moving body with mechanical energy (ME).

The mechanical energy of any body is equal to a constant amount, determined by the following mathematical relationship:

$$\text{Mechanical energy (ME)} = \text{Potential Energy (PE)} + \text{Kinetic Energy (KE)}$$

The mechanical energy of a freely falling body is equal to:

- The potential energy at maximum height.
- Kinetic energy at the moment of reaching the Earth's surface.

Evaluate your understanding:

A car descends from a resting position (A) on a slope until reaching the ground surface at point (C), if the mechanical energy of the car is 600 KJ at position (B).

Determine the value of each of the following for the car:

1- Potential energy at the position (A)

.....

2- Kinetic energy at the position (C)

.....

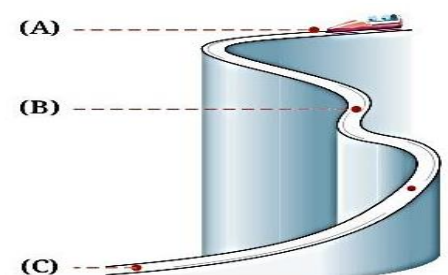
Calculate each of the following for the car:

1- Potential energy at the midpoint of the vertical distance between the two positions (A) (C)

.....

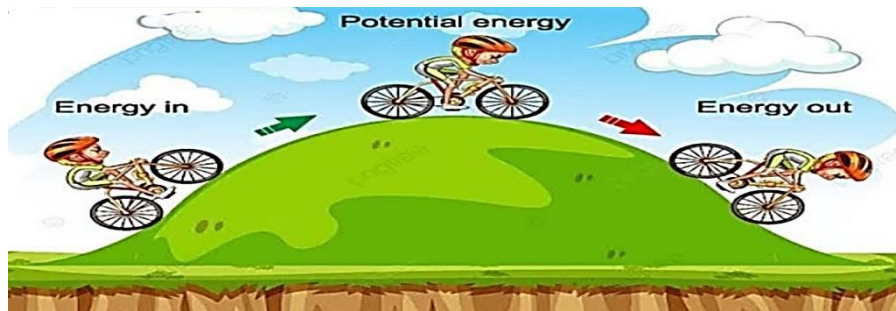
2- Kinetic energy at position (B), if its potential energy is equal to KJ 400

.....



Intermittent concepts: cause and effect

An increase in the potential energy of a body moving vertically upwards results in a **decrease** in kinetic energy by the same amount, and vice versa.



Medical application:

Avoid lifting heavy objects high off the ground in a way that harms your spine, so that the load is not on the back but on the leg muscles to ensure a balance distribution of weight.

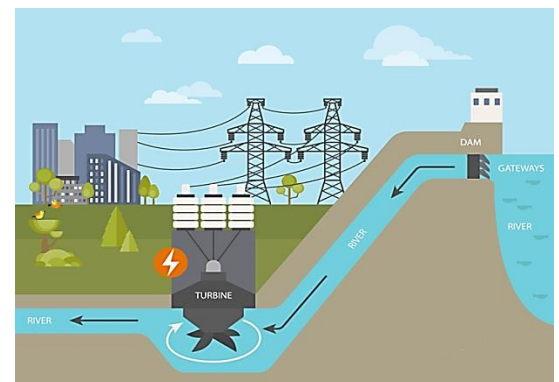


Life App:

(1) Electricity generation from the High Dam:

The Aswan High Dam is one of the most important engineering projects in Egypt in the last century to exploit water energy, as the potential energy of the water held behind the dam is converted into kinetic energy when it rushes down.

This kinetic energy of water causes turbines to operate, generating electricity in a sustainable manner.



(2) Demolition ball:

The wrecking ball is used to demolish old buildings as a result of the potential energy stored in the heavy ball suspended at a height being converted into kinetic energy when it is released.

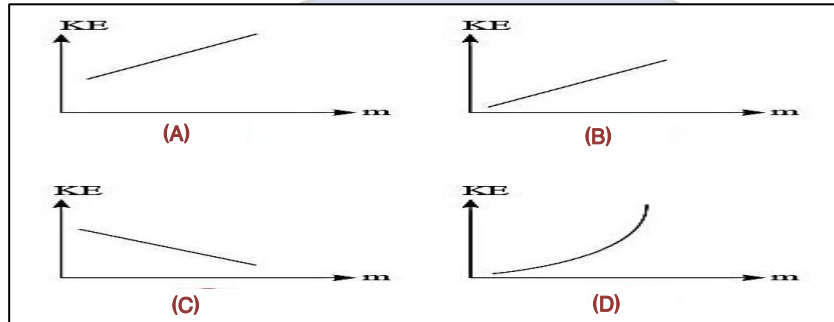
This energy is transferred to the building when the ball hits it, causing it to collapse.



Questions

Choose the correct answer:

1- The relationship between the kinetic energy of a body and the mass of several bodies when their speed is constant is expressed graphically...



2- Which of the following represents the change in potential energy and kinetic energy of a body falling from a high place?

Choices	potential energy	Kinetic energy
(A)	Decrease	Decrease
(B)	Decrease	It increases
(C)	It increases	It increases
(D)	It increases	Decrease

3- When the masses of two cars are equal, the car that does more work is:

- (A) faster
- (B) slower
- (C) At the same speed
- (D) heavier

4- The mechanical energy of a body moving vertically upward is equal to:

- (A) Potential energy only
- (B) Kinetic energy only
- (C) Sum of potential energy and kinetic energy
- (D) The difference between potential energy and kinetic energy.

5- The unit of mass in the kinetic energy equation is:

(A) meter/second

(B) kilogram

(C) Newton

(D) Joule

What does it mean that the mechanical energy of a body is equal to 200J?

.....

What happens to the kinetic energy of a body in the following cases, when...

(1) The mass of the moving body is halved, while its speed remains constant.

(2) The speed of the moving body increases to double, while its mass remains constant.

Correct the mistake in the following sentences:

1- Increasing the speed of a moving body leads to a decrease in kinetic energy.

.....

2- The mechanical energy of a freely falling body increases gradually.

.....

3 -Converting the potential energy of the water held behind the High Dam into electrical energy is done directly.

.....

Show causes:

The work done by the truck is greater than the work done by the car, even though their speeds are equal.

.....

The kinetic energy of a body increases with increasing its speed.

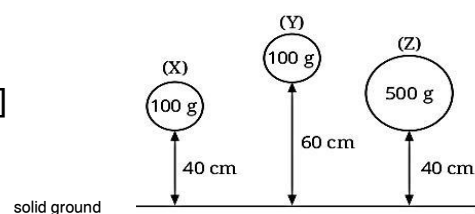
.....

Wrecking ball is capable of demolishing buildings.

.....

The following figure shows three objects falling to the Earth's surface from different heights:

[Knowing that the strength of the Earth's gravitational field 10N/kg]



-Put a check mark (✓) or (✗) in front of the following phrases:

- (1) potential energy of ball X is greater than the potential energy of ball Z ()
- (2) The potential energy of ball Y is greater than the potential energy of ball X. ()
- (3) Balls Z, Y, X are gained kinetic energy when they falling. ()
- (4) Ball Y hitting the ground makes a louder noise than ball Z hitting it. ()

-Calculate the kinetic energy of a body of mass 12KG is moving at a speed of 1 m/s .

-A body of mass 10kg is dropped from a height 4m above ground.

[note that the strength of the Earth's gravitational field 10N/kg]

.....

Calculate the kinetic energy of the body in the following cases:

- 1-The moment before it fell.
- 2-The moment it reaches the Earth's surface.

Calculate the mechanical energy of the body at the midpoint between the point of fall and the ground.

A body of mass 600kg is thrown vertically upwards with a speed of 20m/s , calculate:

Note that: $[1000\text{g}] = \text{kg } 1$

- (1) The kinetic energy of a body at the moment it is thrown upwards.
- (2) The mechanical energy of the body at the maximum height reached by the body.

Calculate the mass of an object with kinetic energy of 80 J moving at a speed of 4 m/s .

Unit two exam

Complete the following:

- 1- The unit of energy measurement is
- 2- The weight of a body with a mass of 10kg is equal to Newtons.
- 3- The mechanical energy of a body is the sum of the energies of and
- 4- When the speed of a body decreases by half, its kinetic energy is
- 5- Gravitational potential energy is directly proportional to and

Choose the correct answer:

1-The variable that is changed during the experiment is known as:

- a) Dependent variable
- b) Independent variable
- c) Control variable

2- The unit of mass in the kinetic energy equation is:

- a) meter/second
- b) kilogram
- c) Newton
- d) Joule

3- The unit of work measurement is:

- a) Newton
- b) Joule
- c) meter

Mention the scientific term:

- 1- The sum of the potential and kinetic energies of a body
- 2- Weight multiplied by height
- 3- The shortest distance between two points
- 4- The energy that a body acquires due to its movement

Compare between:

Potential energy and kinetic energy in terms of definition, symbol and law

Show causes:

- 1- The work done in the case of a man carrying a bucket and walking a horizontal distance is equal to zero.
- 2- Kinetic energy is always positive.

Calculate the speed of a body with a kinetic energy of 200 joules and a mass of 16kg?

Third unit

Environment and genetics

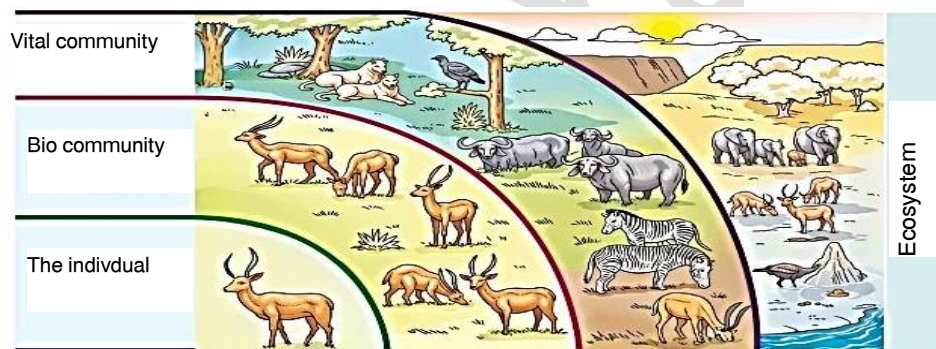


Lesson 1: Food Relationships in Biotic Groups

Lesson 2: Genetic Traits

(Lesson-1) Relationships Food in biomes**Ecosystem:**

It Ecosystem consists of living organisms and non-living components such as water, air and soil, The ecosystem includes several levels of organization, it begins with the individual, which is a single living organism that belongs to a specific type of living organisms and represents species is the basic unit in the classification of living organisms, and it is the group of individuals of the same species that live in one place and time, which is known as a biotic community, the individuals of different biotic communities that live in the same environment constitute what is known as biotic community.

**Patterns of food interactions between members of biological communities:**

The ways in which living organisms obtain food vary, and with them their patterns of relationships vary.

There are relationships that result in harm to one of the two individuals, such as predation, or to both individuals together, such as **competition** and other relationships in which one of the two individuals benefits. **Such as commensalism.** or both individuals benefit without harm to either of them, such as mutual benefit.

Evaluate your understanding:

In light of your understanding of food relationship patterns, Explain the food relationship shown in each of the two following figures:

- Figure 1 shows the relationship
- Figure 2 shows the relationship

**Energy flow between objects:**

All living organisms need energy to survive. Producers get their energy from the sun, which is the main source of energy on the Earth's surface. Some of this energy is then transferred to other living organisms in different paths that include several levels through food chains and food webs.

It is clear from the above:

- The path of energy transfer in the form of food when it is transferred from one living organism to another living organism within the ecosystem is known as the food chain.
- Each stage in which energy is transferred in the food chain is known as Nutritional level.
- Any food chain, whether terrestrial, aquatic or desert, consists of several levels. The first level is occupied by a producer organism, the higher levels (second, third, etc) are occupied by consumer organisms, and it ends with a decomposer organism.
- Organisms that obtain their food from the bodies of dead organisms are known as decomposers, Because it decomposes the organic materials found in the bodies of other organisms after their death into simple materials that mix with the soil and become part of its components.

Life App:**sustainable agriculture...**

The study of food chains is useful in designing food systems in which living organisms are used to eliminate agricultural pests instead of using pesticides in what is known as biological control, such as using spotted beetles (ladybugs) to feed on aphids, which are agricultural pests that infect vegetables and fruits.

**Evaluate your understanding:**

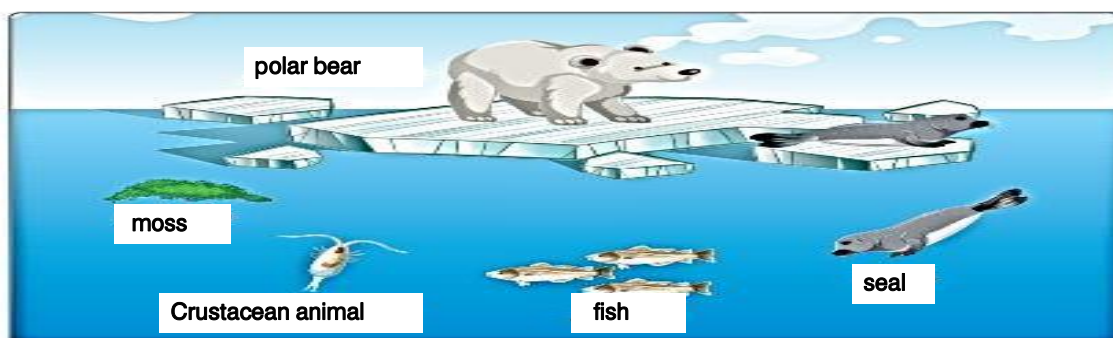
The figure in front of you shows some living organisms in an aquatic environment in the Arctic:

(1) Create a food chain from these organisms.

.....

(2) What organism represents the secondary consumer?

.....

**Food web:**

It is rare to find single food chains in ecosystems, because a single organism can feed on more than one source, at the same time as it is a source of nutrition for several other organisms at higher trophic levels, and the overlap and interconnection of several food chains leads to the formation of what is known as food web.

Cross-cutting concepts: cause and effect

Lack of food sources leads to an increase in competition between living organisms. which affects the numbers of individuals in biological groups.

The absence one of the organisms in a balanced ecosystem affects the rest of the food chain or food web, which leads to an imbalance in this ecological balance and perhaps its destruction.

Increase in the numbers of primary consumers leads to decrease of the number of producing organisms and qan increase in the number of secondary consumers.

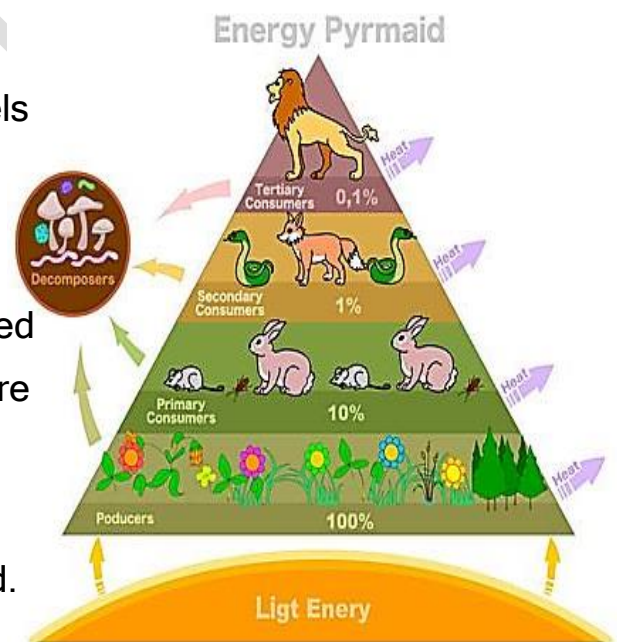
A decrease in the number of secondary consumers leads to a decrease in the numbers of tertiary consumers and increase in the number of primary consumers.

Energy pyramid:

The energy pyramid represents the path and amounts of energy between different trophic levels in any food chain.

The base of the pyramid is occupied by the producers, while the top of the pyramid is occupied by the last consumers in the food chain. The figure shows that 10% Only energy is transferred from living organisms at any level to other living organisms at the next level in the energy pyramid.

That is, only 90% of the energy is used when moving from one level to the next.

**Evaluate your understanding:**

How much energy reaches the third level in a food chain, if the energy of the first level in it is equal to 1000 energy units?

Questions

Choose the correct answer:

1- Which of the following food relationships causes harm to one of the two parties?

- (A) Predation and competition.
- (B) Mutual benefit and coexistence.
- (C) Mutualism and predation.
- (D) Predation and commensalism.

2 - A food chain includes an insect, a fish, a plant, and a swan. Which of these organisms is both a predator and a prey?

- (A) The insect.
- (B) The fish.
- (C) Plant.
- (D) The swan.

3- The following table represents 5 living organisms and the food of each:

living organism	food of living organism
(1)	insects, dead animals
(2)	Scorpions, reptiles, snakes, mice
(3)	weeds, seeds, berries
(4)	dead animals
(5)	Rabbit, mice, birds, squirrels

Which of the following represents a correct food chain?

- (A) Berry → (1) → (2) → (3).
- (B) Weeds → (3) → (2).
- (C) Cactus → (1) → (4).
- (D) Seeds → (4) → (2) → (5)

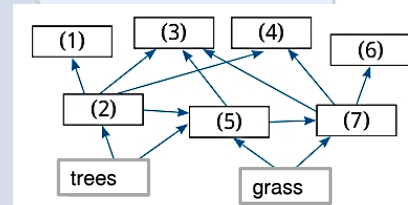
4 - Rabbits were introduced to Australia about a hundred years ago, and soon their numbers increased dramatically, producing...

- (A) Decrease in the percentage of green cover.
- (B) Increase biodiversity.
- (C) The presence of few predators.
- (D) The presence of large numbers of predators.

5- In the following food web:

Which of the following feeds on one producer organism and is fed by 3 predators?

- (A) (5) , (7)
- (B) (5), (2)
- (C) (2) , (7)
- (D) (2) , (3) , (7)



6- The organism that occupies the top of the energy pyramid in the food chain is:

- (A) The producing object
- (B) The analyzing organism
- (C) The last consumer
- (D) Primary consumer

7- A decrease in the number of secondary consumers leads to:

- (A) Decrease in the number of productive organisms
- (B) Increase in the number of primary consumers
- (C) Increase in the number of tertiary consumers.
- (D) Ecosystem stability

8- The transfer of energy in the energy pyramid from one trophic level to another is limited to:

- (A) 90% of energy
- (B) 10% of energy
- (C) 50% of energy
- (D) 100% of energy

Show causes:

1- The nutritional relationship between bees and plant flowers is a mutually beneficial relationship.

2- The feeding relationship between the Nile crocodile and the plover is not a mutually beneficial relationship.

3- The absence of one of the living organisms in a balanced ecosystem is a cause of an imbalance in the ecological balance.

4- There are often no single food chains in ecosystems.

5- Ladybugs are used in biological control instead of insecticides.

What effect does hawks have on the number of worms in a food chain consisting of grass, hawks, worms, and snakes?

What is the type of nutritional relationship between each of the following:

(1) The wolf and the rabbit.

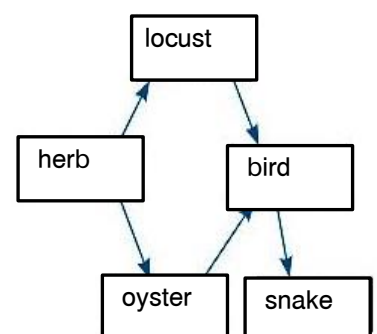
(2) Fly and Dionea plant.

(3) Polar bear and seal.

In the following food web:

(1) How many food chains make up this web?

(2) Complete: To reduce the number of oysters, it is necessary to increase the number of and reduce the number of



Complete the following sentences:

- 1- An ecosystem consists of living organisms and non-living components such as: ... and ... and
- 2- The base of the energy pyramid is occupied by organisms, while the top of the pyramid is occupied by the objects
- 3- Lack of food sources leads to increased ... among living things.

Correct the mistake in the following sentences:

Energy transfer in the food chain is 90% of the energy to the next level.

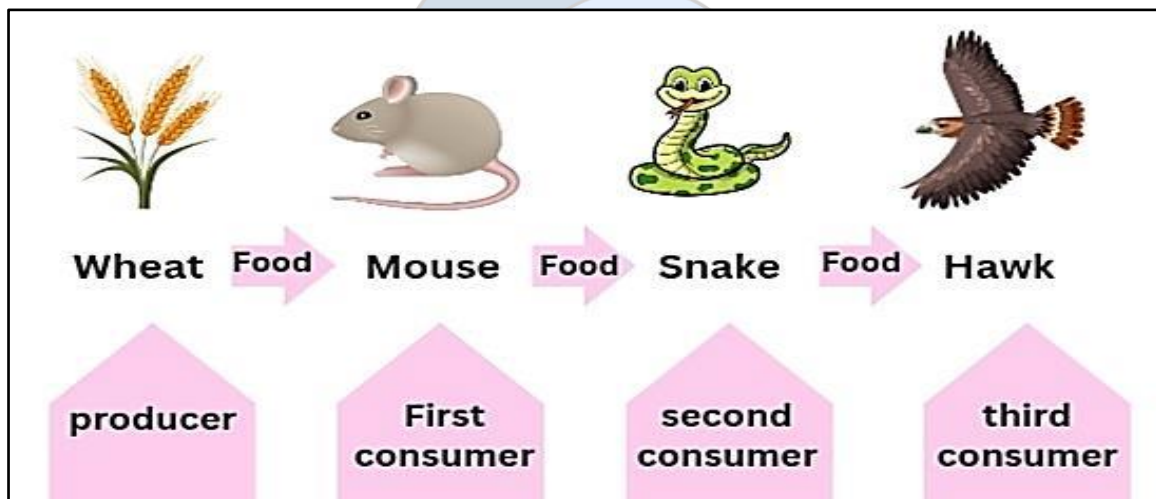
Food chains in ecosystems are limited to only producers and primary consumers.

Increased numbers of primary consumers lead to increased numbers of producers.

Arrange the following food chain:

Mouse - grass - snake - Bacteria - hawk

In the following figure, what is the effect of the absence of snakes?



(Lesson-2) Genetic Traits**Genetic and acquired traits:**

- All living organisms perform a set of vital processes, including reproduction.
- They all reproduce to produce new individuals that resemble their parents.
- The science that studies the transmission of genetic traits from parents to offspring is called with genetics.

It is clear from the above:

- There are traits that are passed from parents to without learning and are inherited from one generation to the next, such as the color of human hair, the short legs of the arctic fox, and the presence of a hard skeleton covering the body of the turtle. such traits are known by genetic traits.
- There are behaviors and skills that are passed on from parents to children without learning, such as spiders weaving webs to catch insects and chickens sitting on eggs. Such behaviors are known as behaviors Instinctive (instinct).
- There are traits that are not inherited from parents but are acquired from the surrounding environment through learning or training and are not passed on from one generation to the next. Such traits are known as acquired traits. Examples of these traits include a child learning to walk and learning languages.



Evaluate your understanding:

Classify the following into genetic traits, acquired traits, and instinctive behaviors:

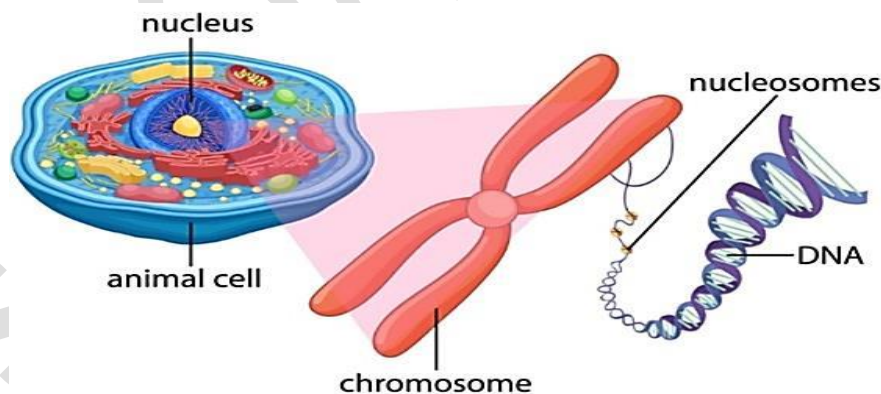
- | | |
|------------------------|------------------------------|
| 1- Reading and writing | 2- Facial freckles |
| 3- Curly hair | 4- The bird builds its nest. |
| 5- Breastfeeding | 6- Horse jumping hurdles |

Chromosomes and the transmission of genetic traits:

Genetic material is found in cytoplasm prokaryotic organisms and nuclei of eukaryotes, in the form of thread-like bodies known as Chromosomes, which are responsible for transmitting genetic traits from parents to children.

chromosome structure:

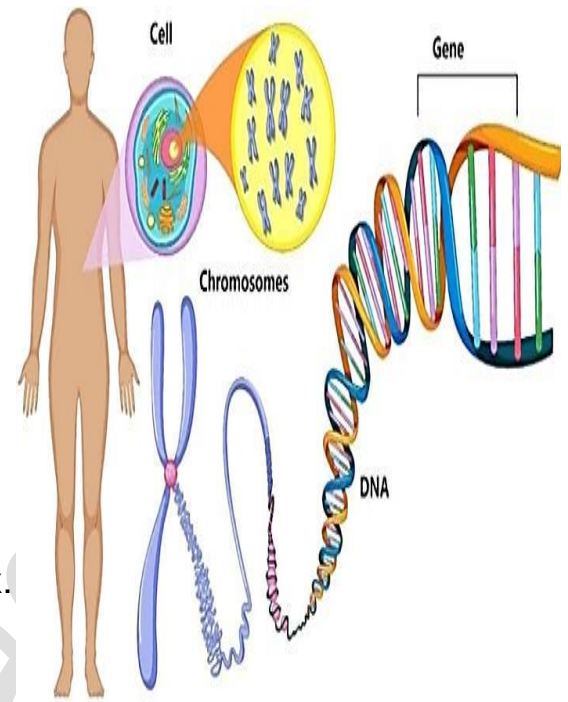
Each chromosome consists of two strands, each called a chromatid, they connect at a central point called the centromere.



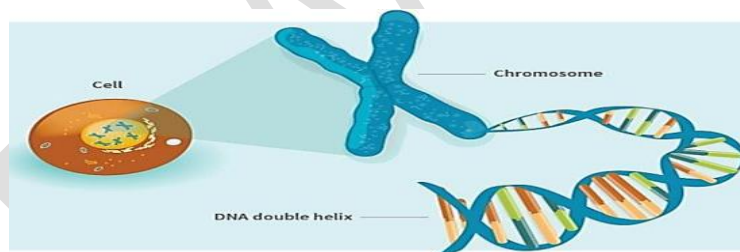
Individuals of the same species agree on the number of chromosomes found in their somatic cells. such as liver and skin cells, and their number varies from one organism to another, as shown in the table.

living organism	corn plant	Bees	man
Number of chromosomes	20	32	46

- A chromosome is chemically composed of DNA wrapped around a type of protein called histones.
- DNA is made up of small parts called genes which consists of each of them is made up of a sequence of smaller building blocks called nucleotides.
- It is found in the form of two strips wrapped around each other, forming what is known as a double helix. and genes are responsible for the appearance of genetic characteristics of the living organism.



- A single chromosome carries thousands or millions of genes, the number of which varies from one chromosome to another in the cells of the same individual.



The role of genes in expressing hereditary traits:

Genetic traits are passed from parents to children through genes, with an individual inheriting half of his genetic genes from his father and the other half from his mother.

The two scientists **Beadle** and **Tatum** came up with the one-gene-one-enzyme hypothesis, which states that each gene produces a specific enzyme, and this enzyme is responsible for chemical reaction that leads to the formation of protein that shows a specific genetic trait.

Mutations:

Why do some cows look bigger compared to other cows?

What are the reasons for a person was born with a hand that had six fingers?



-A change may occur in the nature of the gene, such as a change in the order of the nucleotides that make it up.

which leads to a change in the genetic trait for which this gene is responsible.

Thus, a new trait appears that did not exist before, and this is known as a mutation.

Mutations may occur naturally, as in the birth of a black mother to an albino son.

Such mutations are known as spontaneous mutations.



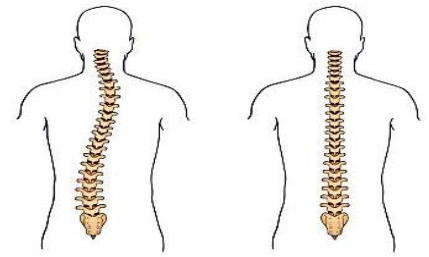
-It may occur through human intervention, as in the production of featherless chicken to save energy electricity used in air conditioning farms in free zones.

Such mutations are known as induced mutations.



Effect of mutations:

Mutations may be harmful, some may lead to death, and some may be beneficial. Harmful mutations include scoliosis, and lethal mutations result in severe muscle atrophy and weakness in some newborns.



Mutations can be beneficial whether they occur naturally or through human intervention.

One of the beneficial natural mutations is changing the skin color to match the environment, as in light skin color of people living in cold countries to help them absorb vitamin D.



Mutations that produce seedless fruits or wheat plants that are not affected by wheat rust are all beneficial mutations created by human.



Integration with agricultural science:

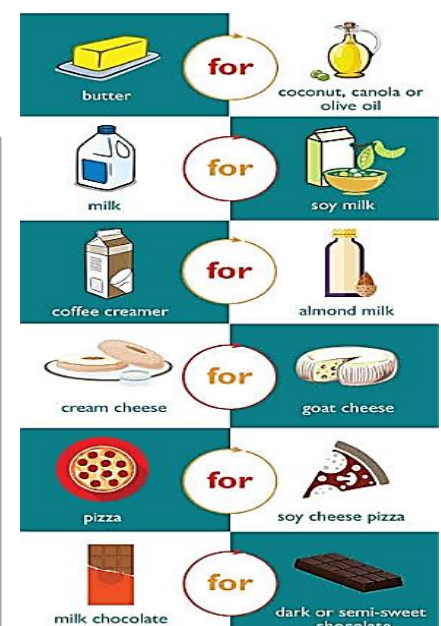
The production of cube-shaped watermelons for the purpose of facilitating their transportation is not a result of a mutation, but rather an agricultural technique, in which watermelons are placed in square molds as it grows, making it take the shape of the mold.



Life App:

*Lactose intolerance is a natural mutation that causes the lactose sugar found in milk and milk products such as cheese and yogurt to be converted into simpler sugars that are easier for the body to absorb.

*People who suffer from lactose intolerance feel cramps, nausea, and other symptoms when drinking milk or eating milk products, all of which are painful. They can avoid milk and milk products and use other products shown in the figure that do not cause these symptoms.



Complete the following sentences:

- 1- The short legs of arctic foxes are a characteristic of while the tameness of lions is a characteristic of.....
- 2- It consists of DNA is made up of small parts called each of which consists of a sequence of
- 3- Scientists Beadle and Tatum concluded that each gene is responsible for producing especially the
- 4- Genes responsible for producing an enzyme that causes a chemical reaction to occur leading to a specific genetic trait are called ...
- 5- DNA is made up of sequences of small units called
- 6- Mutations that occur in the absence of human intervention, such as a black mother giving birth to an albino son, are.....
- 7- The number of chromosomes in somatic cells is.....

Choose the correct answer:

- 1- Millions of nucleotides come together directly, forming.....

(A) Chromosomes. (B) Chromatids.
(C) Genes. (D) Histones.

- 2- Which of the following are lethal natural mutations, and which are beneficial spontaneous mutations, respectively?

(A) Children's muscular atrophy seedless grapes.
(B) Juvenile muscular dystrophy, lactose intolerance.
(C) A palm with six fingers, carrying lactose sugar.
(C) A hand with six fingers, a cube-shaped orange.

3- What is the composition of the mixture used to separate strawberry chromosomes?

- (A) Salt, dishwashing detergent and water only.
- (B) Salt, ethyl alcohol and water only.
- (C) Dishwashing detergent and ethyl alcohol only.
- (C) Salt, dishwashing detergent and ethyl alcohol.

4-The genetic characteristics of an organism appear due to:

- (A) Histones
- (B) Chromatids
- (C) Genes
- (D) nucleotides

5- An organism that has 46 chromosomes in its somatic cells is:

- (A) Human
- (B) Bees
- (C) Corn plant
- (D) Strawberries

6- Mutations resulting from human intervention are known as:

- (A) Spontaneous mutations
- (B) Natural mutations
- (C) Induced mutations
- (D) Lethal mutations

7- The reason for producing cube-shaped watermelons is:

- (A) A new mutation
- (B) Spontaneous mutation
- (C) Agricultural technology
- (D) Natural mutation

Look at the next figure and answer:

(1) What is the name given to people who have the appearance of this child?

.....

(2) What is the scientific explanation for the birth of this child with black skin?

.....



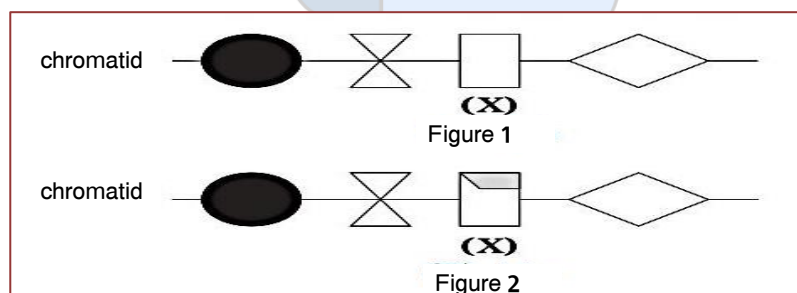
Figure (1) represents part of a chromosome in the body of a woman, and the illustration (2) represents the same chromosome in another cell in the body of the same woman.

(1) What is the name of the part (X) on the chromatid?

.....

(2) What is the name given to the change that occurs in the part (X) in Figure (2)?

.....



What is the hypothesis which was reached by the scientists Biddle and Tatum?
What does it mean?

.....

Causes:

- 1- Some cows look huge compared to other cows.
- 2- A person being born with a hand that has six fingers is an example of mutation.
- 3- People with lactose intolerance feel cramps and nausea after consuming milk.

Correct the mistake in the following sentences:

The genes responsible for the hereditary characteristics of an organism are found in histones.

.....

Induced mutations occur naturally without human intervention.

.....

The production of wheat plants resistant to wheat rust is an example of a spontaneous mutation.

.....

The production of cube-shaped watermelons is the result of a genetic mutation.

.....

Interpretive question:

Why are mutations sometimes beneficial and sometimes harmful?

.....

Unit three exam

Complete the following sentences:

- 1- Genes responsible for producing an enzyme that causes a chemical reaction to occur leading to a specific genetic trait are called
- 2- DNA is made up of sequences of small units called
- 3- Mutations that occur in the absence of human intervention, such as a black mother giving birth to an albino son, are
- 4- The number of chromosomes in somatic cells is

Correct the mistake in the following sentences:

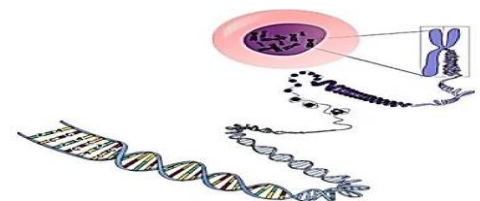
- 1- The genes responsible for the genetic characteristics of the organism are found in histones.
- 2- The newly created mutations occur naturally without human intervention.
- 3- Producing wheat plants resistant to wheat rust is an example of spontaneous mutation.
- 4- The production of cube-shaped watermelons is the result of a genetic mutation.

Causes:

- 1-The absence of one of the living organisms in a balanced ecosystem is a cause of an imbalance in the ecological balance.
- 2-There are usually no single food chains in ecosystems.

Why are mutations sometimes beneficial and sometimes harmful?

In light of the opposite figure, explain the chemical composition of the chromosome?



In light of what you have studied of the types of mutations, to which type does the mutation that produces a cube-shaped watermelon belong?

Fourth unit

Nature cycles



Lesson 1: The Water Cycle

Lesson 1: Rocks

(Lesson-1) Water Cycle

Water:

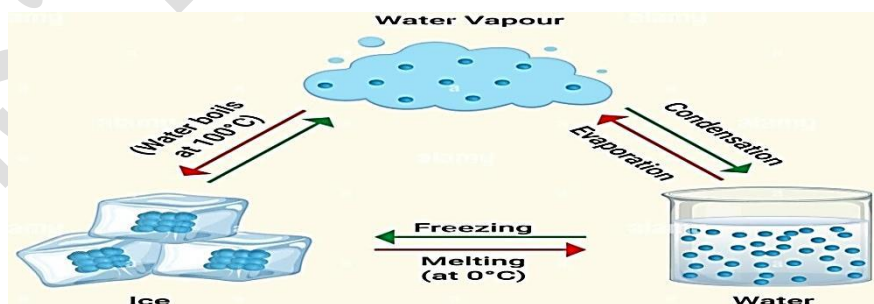
Water makes up about 70% of the human body, and about 71% of the Earth's surface.



- Water is used for drinking, agriculture, industry, and sanitation, and plays a vital role in regulating the Earth's temperature.
- Water exists in three states of matter **solid**, **liquid** and **gaseous**.
- Fresh water represents only about 3% of the water on the surface of the Earth, which makes its preservation and rational consumption necessary to ensure its sustainability in the future.



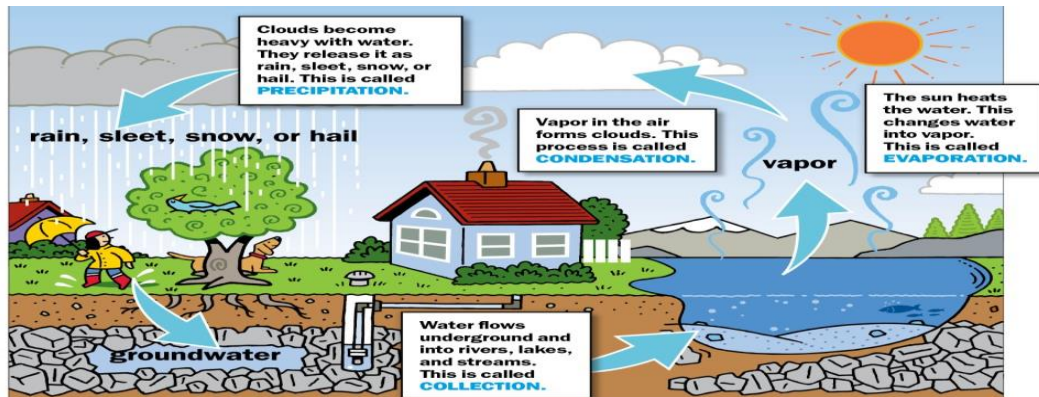
- ☞ Water changes from a **liquid** state to a **gaseous** state (water vapor) when it gain heat in a process **known as evaporation** which is done at a temperature.
- ☞ Water vapor changes from a **gaseous** state to a **liquid** state when heat is lost in a process known as condensation, which occurs at any temperature, as shown in the water state transformayion diagram.

**Assess your understanding:**

- (1) Compare between the effect of the sun on the evaporation process in tropical and polar regions.
- (2) What is the difference between evaporation process and boiling process?

Water cycle in nature:

The water cycle is a natural process that involves the movement of water between the atmosphere and the earth in a closed, multi-path cycle, as follows:



There are many sources of water vapor in nature, as follows:

- The process of evaporation of water from large bodies of water such as rivers, seas and oceans.
- The process of production in plants (the process of the plant losing water in the form of water vapor).



Multiple pathways in the water cycle:

- 1- The process of evaporation of water on the Earth's surface occurs due to the energy derived from the sun's heat.
- 2- Air currents in contact with the Earth's surface carry water vapor upwards, where it loses energy and its temperature drops, causing condensation and tiny water droplets to collect to form clouds.
- 3- Winds move clouds, which collect tiny water droplets forming Larger and heavier drops.
- 4- Heavy cloud water droplets fall and return to the Earth's surface due to gravity as rain. Part of it absorbed into the earth and stored in the form of groundwater, while the other part flows on the surface of the earth due to gravity in the form of surface runoff into rivers, seas and lakes, and part of it turns into oceans. With the continuation of these processes, the water of water bodies is renewed.

When the cloud temperature is below the gathering temperature, snow falls instead of rain, and when small ice crystals gather during thunderstorms, hail falls.

Note:

The Sun and Gravity together keep the water cycle going. The sun moves water from the ground to the ocean, and gravity returns water to the earth, keeping the ecosystem in balance.

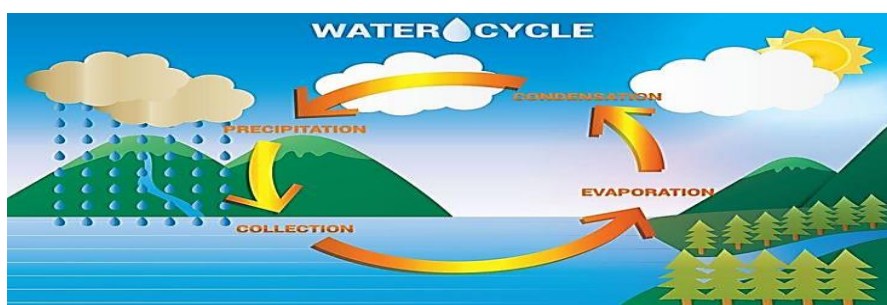
**Assess your understanding:**

Complete the table to identify the states of water as it moves through the various pathways in the water cycle:

water path	water condition
Evaporation
Condensation
Surface runoff
Transpiration
Precipitation
Leakage

Cross-cutting concepts: systems and their models

Water forms a biological system. And a comprehensive model in which different pathways interact periodically and illustrates the interrelationship between the components of the system and their effects on the environment, supporting the understanding of natural processes and helping to predict their future changes.



Choose the correct answer:

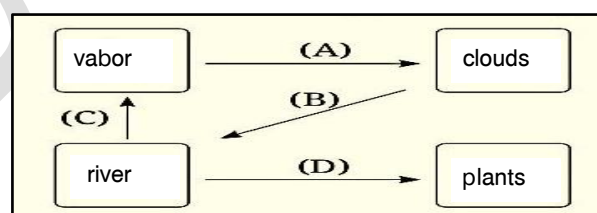
1- Clouds and rain are formed by two processes:

- (A) Coalitions and precipitation.
- (B) Condensation and evaporation.
- (C) Evaporation and surface runoff.
- (D) Precipitation and runoff.

2- A person wearing wet clothes feels cold, even though the weather is warm because

- (A) Water loses heat when it evaporates.
- (B) Water gains heat when it evaporates.
- (C) Water vapor loses heat when it condenses.
- (D) Water vapor gains heat when it condenses.

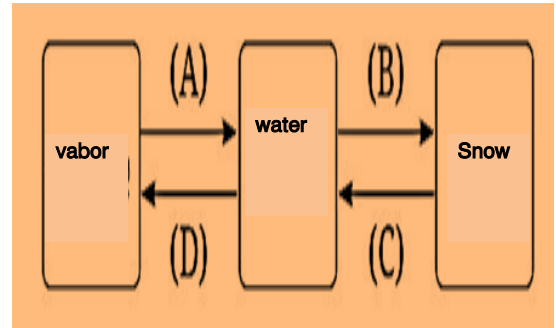
3- From the following diagram: ?Which of the following is true



Choices	liquid → gas	gas → liquid
(A)	(B)	(D)
(B)	(C)	(A)
(C)	(C)	(A),(B)
(D)	(A),(D)	(B)

4- From the following diagram: What two processes occur when heat energy is gained?

- (A) A , B (B) A , B
(C) B , C D , C (D)



- What two processes occur at any temperature?

- (A) Melting and boiling.
(B) Evaporation and condensation.
(C) Melting and evaporation.
(D) Evaporation and boiling.

5- Water makes up about from the surface of the earth.

- (A) 70% (B) 71% (C) 3% (D) 50%

6- The amount of fresh water available on the Earth's surface represents about:

- (A) 50% (B) 25% (C) 10% (D) 3%

7- The process by which water changes from a liquid to a gaseous state due to heat is called:

- (A) Condensation (B) Evaporation
(C) Freezing (D) Fusion

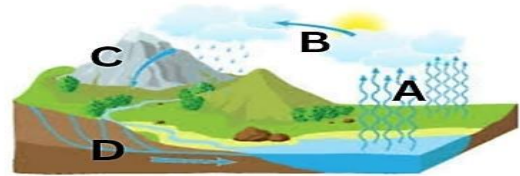
8- The process that returns water to the Earth as rain or snow is called:

- (A) Evaporation (B) Condensation
(C) Precipitation (D) Surface runoff

The following figure represents the water cycle.and:

Replace the letters (A) , (B) , (C) , (D) with the appropriate terms from the following:

- condensation.
- evaporation.
- Surface runoff
- precipitation.



Explain the role of living organisms in the water cycle..

Why is boiling point a property of pure substances, not evaporation?

Complete the following sentences:

- 1- The water cycle is defined as the movement of water between and in a closed cycle.
- 2- works to transfer water from the ground to the atmosphere, while works to bring it back to earth.
- 3- Tiny water droplets collect in clouds as a result of temperature during the condensation process.
- 4- Part of the rainwater seeps into the ground to be stored as

Causes:

- 1-Water is a vital element in regulating the temperature of planet Earth.

- 2-Fresh water represents a small percentage of the total water on the Earth's surface.

- 3-The sun and gravity are two major elements in the water cycle.

True or false (with correction):

1- Surface runoff is the process by which water changes from a solid state to a liquid state.

.....

2- The water cycle involves the movement of water between the Earth and the atmosphere in a closed path.

.....

3- All water on the Earth's surface can be used directly for drinking.

.....

4- Rainfall does not affect the ecosystem.

.....

Explanatory questions:

1-How does the water cycle contribute to the renewal of water bodies?

.....

2-Why it is necessary to conserve fresh water and rationalize its use?

.....

3-What role do clouds play in the water cycle?

.....

(Lesson-2) Rocks

Rocks:

Rocks are solid bodies composed of one or more Minerals, rocks are found on the surface of the Earth, below it, or at the bottom of the oceans.

Rocks are classified into three main types:

Types of rocks**(1) Igneous rocks**

The increase in temperature and pressure from earth's crust to the interior of the earth leads to the melting of the minerals that make up some rocks, which leads to the formation of magma, which is what igneous rocks are made of

Igneous rocks are classified into two types according to the place where they solidify:

1- If it comes out of the magma with the rest of the volcanic products to the surface of the earth, it loses a large amount of gases mixed with it, forming what is known as cells that cool quickly, forming rocks with small crystals known as surface igneous rocks, such as basalt and pumice.

2- If magma enters between cracks and layers of the earth's crust, it cools very slowly, forming rocks with large crystals known as igneous rocks, such as granite and gabbro

gabbro



granite

**(2) Sedimentary rocks**

Fine rock fragments known as sediments are deposited in places of deposition and the sediments are compressed over the years into layers that undergo a lithification process that turns them into cohesive rocks.

Sedimentary rocks are characterized by being porous due to the presence of spaces between the sediment particles that make them up. They also contain fossils.

Examples:
Limestone
Sandstone
mudstone

**(3) Metamorphic rocks**

Rocks that arise from igneous or sedimentary rocks that existed before under the influence of heat, pressure and active chemicals solution.

This transformation occurs when the natural and chemical conditions to which the rocks are exposed change, making many of the minerals that make up the rock unstable to the new conditions and thus transforming into new minerals that are more suitable for the new environment.

Examples:
Limestone turned into marble
Sandstone turns into quartzite.



Earth's cycle of rock formation

First: Weathering

It is a process of disintegration and breaking of rocks and may take millions of years.

Types of weathering:

1- Mechanical weathering:

It is the process of disintegration and breaking of rocks without changing their chemical composition.

2- Chemical weathering:

It is the process of disintegration and breaking of rocks, causing a change in their chemical composition.

Chemicals such as acids and minerals in groundwater and acid rain cause chemical weathering of rocks.

Spherical weathering is one of the forms of chemical

Examples:

Yellowstone springs USA



Second: Erosion

It is a process that occurs on the surface of the earth, such as the flow of water and wind, which removes soils, rocks, or dissolved materials from the location of the earth's crust and transports them to another location.

One of the beneficial effects of the erosion process is the formation of river deltas.

One of the harmful effects is the erosion of beaches by waves.





Third: Melting and crystallization

When rocks beneath the Earth's surface are exposed to pressure and heat without reaching the melting point, the rock particles come closer together, reducing the spaces between them, which leads to an increase in their hardness, forming new rocks known as metamorphic rocks.



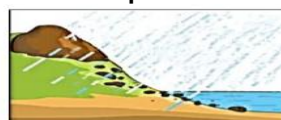
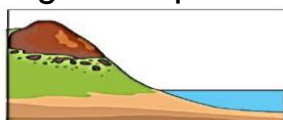
Comparison between limestone and sandstone:

1- Limestone	2- Sandstone
	
Formation	
It consists of the precipitation of calcium carbonate in lime solutions.	It consists of the cohesion of sand grains that less than 2mm in diameter.
The color	
white	yellow
Texture	
smooth	rough
Shape	
In thin layers	In thin layers
cohesion	
weak cohesion	coherent
Minerals that make it up	
It consists of: Calcite (calcium carbonate)	The main component is mostly: Quartz mineral

-Three types of rocks are used in construction, as in the use of limestone in building the pyramids of Giza in Egypt and marble in building Taj Mahal in India.

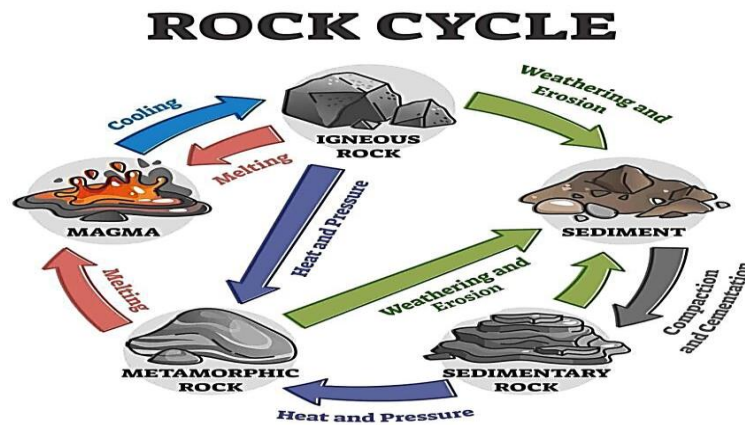
Evaluate yourself:

1- Which of the two figures represents an erosion process? with explanation.



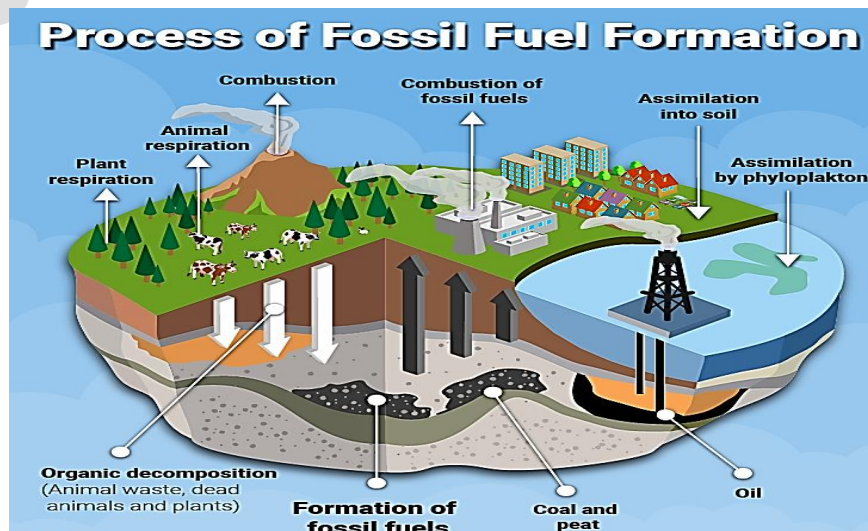
Cross-cutting concepts: cause and effect

Rocks change from one type to another through several processes. such as: weathering and erosion, extreme pressure and heat, melting and cooling forming what is known as the rock cycle.



Earth's cycle of fossil fuel formation:

- The light energy of the sun is converted into chemical energy stored in the plant through the process of photosynthesis, part of this energy is transferred to the living organisms that feed on the plants.
- Fossil fuels may have been formed millions of years ago, as a result of a series of physical and chemical changes in organic materials deep within the earth. Plants especially large ones represent the organic origin of coal, while tiny marine animals represent the organic origin of petroleum (oil).
- Methane gas represents more than 90% of the components of natural gas, and when fossil fuels are burned, the energy stored in it, and its derivatives basically from the sun.



Questions Choose the correct answer:

1- The three types of rocks are divided according to:

(A) The darkness in which it is found.

(B) Its chemical properties.

(C) Its relative immersion.

2- Metamorphic rocks are formed by two processes:

(A) Melting and crystallization.

(B) Transport and deposition

(C) Heat and pressure.

(D) Erosion and weathering.

3- Which of the following represents the correct classification of rocks?

Choices	Limestone	Granite	Marble
(A)	Metamorphic rock	igneous rock	Sedimentary rock
(B)	Sedimentary rock	igneous rock	Metamorphic rock
(C)	rosy sedimentary rock	Transforming desert	igneous rock
(D)	igneous rock	Metamorphic rock	Sedimentary rock

4- Rock cycle model

- (A) No change in rocks.
- (B) How magma is formed.
- (C) How sediments are formed.
- (D) Rock transformations.

5- Which of the following shows the correct order to form Sandstone rocks?

- (A) Weathering → Transport → Precipitation
- (B) Erosion → Weathering → Deposition
- (C) Melting → Cooling → Crystallization
- (D) Pressure → Heat → Tablr.

Rocks are made up of

- (A) A metal or several metals
- (B) Organic materials only
- (C) Chemicals

6- Rocks that are formed by the disintegration of rocks and the processes of pressure and heat are called:

- (A) igneous rocks
- (B) Sedimentary rocks
- (C) Metamorphic rocks
- (D) Limestone rocks

7- Rocks that are formed from the accumulation of rock fragments are called:

(A) Igneous rocks

(B) Metamorphic rocks

(C) Sedimentary rocks

(D) Basement rocks

8- If rocks are exposed to heat and pressure in the interior of the earth without reaching the melting point, they turn into:

(A) Sedimentary rocks

(B) Igneous rocks

(C) Metamorphic rocks

(D) Liquid rocks

Complete the following sentences:

1- is the process of fragmentation and breaking rocks, while transporting sediments from their place to and depositing them.

2- Basalt is an igneous rock ... while granite is an igneous rock

3- Large plants represent the organic origin of fuel.

4- Weathering is a process rocks into small pieces without changing their chemical composition.

5- Erosion is a process rock fragments resulting from weathering to other areas.

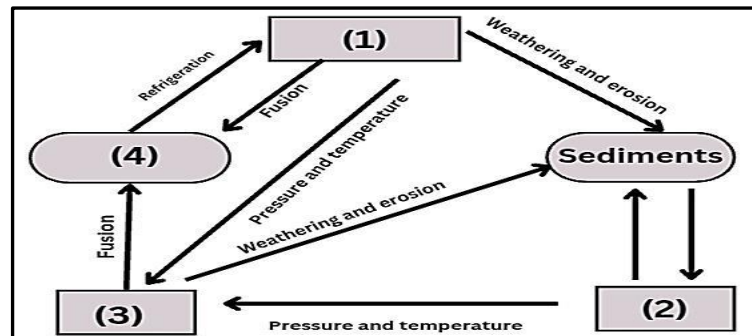
6- When rock is exposed to heat and pressure inside the Earth without melting, then ... rocks get harder and harder.

7- Magma is the molten rock that is formed from minerals in rocks are formed as a result of extreme heat and pressure.

The following model shows the rock cycle:

Replace the numbers from (1) : (4) with the appropriate ones from the following:

- Sedimentary rocks.
- Igneous rocks.
- Metamorphic rocks.
- Magma.



What processes lead to transformation?

- (1) limestone to marble.
- (2) Quartzite to sandstone.

Causes:

- 1-Sedimentary rocks do not turn into igneous rocks.
- 2-Rocks turn into metamorphic rocks when exposed to heat and pressure.
- 3-Igneous rocks contain large crystals.

True or false questions (with correction):

- 1- Sedimentary rocks are formed from chemical reactions in the interior of the earth.
()

.....

2- Extrusive igneous rocks are formed when magma cools rapidly on the Earth's surface. ()

.....

3- The transformation of rocks from one type to another occurs only due to the intense heat inside the Earth. ()

.....

4- The use of rocks in construction is due to their properties of hardness and heat retention. ()

.....

Interpretive questions:

1-How are sedimentary rocks formed?

.....

2-How do heat and pressure affect metamorphic rocks?

.....

3-Why are igneous rocks considered to be large crystals?

.....

Answer the following:

- 1- How are sedimentary rocks formed?
- 2- How do heat and pressure affect metamorphic rocks?
- 3- Why are igneous rocks considered to be large crystals?

Complete the following sentences:

- 1- The water cycle is defined as the movement of water between and in a closed loop.
- 2- works in transport water from the ground to the atmosphere, while to bring it back to earth.
- 3- Tiny water droplets collect in clouds as a result of temperature during condensation.
- 4- Part of the rainwater seeps into the ground to be stored as

Mention the characteristics of sedimentary rocks?Causes:

- 1- Water is a vital element in regulating the temperature of planet Earth.
- 2- Fresh water represents a small percentage of the total water on the Earth's surface.
- 3- Fresh water represents a small percentage of the total water on the Earth's surface.
- 4-The sun and gravity are two major elements in the water cycle.